VOL. 79 No. 2011
25 JANUARY 1958

Telephone: FLEet Street 3212 (26 Lines)
Telegrams: Allangas - Fleet - London

Editor M. C. HYDE
Manager H. A. WILLMOTT
Director N. B. LIVINGSTONE WALLACE

Midland Office
Daimler House, Paradise Street, Birmingham. [Midland 0784-5]

Leeds Office
Martins Bank Chambers, Park Row, Leeds 1. [Leeds 22601]

Scottish Office
116 Hope Street, Glasgow, C2. [Central 3954-5]

IN THIS ISSUE

Disproportionating Process	190
Chemicals in 1957	191
Distillates	192
ABCM Work Study Report	193
ICI's Indian Investments	194
Nuclear Energy Symposium	195
Battelle Work Published	197
New Shell Insecticide	197
Glue Laboratories Opened	198
Overseas News	199
Equipment Review	201
People in the News	204
Commercial News	205
For Your Diary	205
Market Reports	205
Chemical Prices	206
Stocks and Shares	207
New Patents	208
Trade Notes	209

Annual subscription is: home, 52s 6d, overseas, 60s, single copies 1s 6d (by post 1s 9d)

CHEMICAL AGE

BOUVERIE HOUSE · 154 FLEET STREET · LONDON · EC4

PROGRESS IN 1957

WHILE it is too early to make a detailed assessment of how the various sections of the chemical industry fared in 1957, it was unquestionably a year of progress from the point of view of production, greater efficiency, exports and expenditure on new plants, modernisation, research, etc. Output in the industry expanded at a greater rate than did manufacturing industry generally, and it is particularly significant to note that the slowing down in the expansion rate, evident in 1955 and 1956, was not only halted but a slight improvement was shown.

Despite all that there was a justifiable uneasiness in the industry. Perhaps the most telling barometer of the chemical, or any other industry, is the profitability of its operations. Production may expand, sales may rise and exports may hit a record, but if that is not accompanied by a healthy expansion in profits, then executives have every cause to feel uneasy about the future. As it was, 1957 saw an ever-continuing rise in costs of production, and there can be little doubt that sales expanded because there was a fairly general pegging down of prices.

But there is a limit to which prices can be held, either by sacrificing profit margins or by increased efficiency. One thing seems fairly certain in 1958; manufacturers will be compelled by the credit squeeze to raise prices of certain of their products. That will put salesmanship at a premium in the export markets and those companies that have developed or are developing, new products will probably be in a better position than others.

That the chemical industry is forging ahead, even if at a less profitable level, must mainly be due to the number of large units that are self-financing or which depend on US capital for their expansion projects, and to new plant, started in 1955 or 1956, which is now coming on stream.

The annual report of the chemical and allied trades' section, Manchester Chamber of Commerce (see p. 191) shows the general trend of 1957 and sounds a warning for the future. If studied in connection with the OEEC report on the chemical industry in Europe (CHEMICAL AGE, 18 January, p. 159) and the article on UK chemical exports by Mr. George Brearley (CA, 11 January, p. 99) and the CHEMICAL AGE survey of 1957 (CA, 11 January, p. 87), it will be seen that the UK chemical industry has a sound basis as regards production, exports and plant modernisation.

Such weaknesses as there are, are outside the industry's control: disinflationary policies in the UK, the possibility of a minor recession in the US and the tariff barriers periodically raised by other countries, the latest example being New Zealand. But with their present record, UK chemical manufacturers can look to the future with confidence.

One of the hopes for the year must be that the tighter money policy of the Treasury will come to a successful end. It is difficult to see how production can increase significantly in a period of enforced disinflation, and the danger to the economy of the present policy is that its rigid enforcement for too long may well lead to industrial stagnation. It will take a strong Chancellor of the Exchequer to decide when the time is ripe for a loosening of the shackles.

As it is, the country is still gripped by the vicious circle of rising costs

VOL. 79 No. 2011
25 JANUARY 1958

Telephone: **FLEet Street 3212** (*26 Lines*)
Telegrams: **Allangas - Fleet - London**

Editor M. C. HYDE
Manager H. A. WILLMOTT
Director N. B. LIVINGSTONE WALLACE

Midland Office
Daimler House, Paradise Street, Birmingham. [*Midland* 0784-5]

Leeds Office
Martins Bank Chambers, Park Row, Leeds 1. [*Leeds* 22601]

Scottish Office
116 Hope Street, Glasgow, C2. [*Central* 3954-5]

IN THIS ISSUE

Disproportionating Process	190
Chemicals in 1957	191
Distillates	192
ABCM Work Study Report	193
ICI's Indian Investments	194
Nuclear Energy Symposium	195
Battelle Work Published	197
New Shell Insecticide	197
Glue Laboratories Opened	198
Overseas News	199
Equipment Review	201
People in the News	204
Commercial News	205
For Your Diary	205
Market Reports	205
Chemical Prices	206
Stocks and Shares	207
New Patents	208
Trade Notes	209

Annual subscription is: home, 52s 6d, overseas, 60s, single copies 1s 6d (by post 1s 9d)

CHEMICAL AGE

BOUVERIE HOUSE · 154 FLEET STREET · LONDON · EC4

PROGRESS IN 1957

WHILE it is too early to make a detailed assessment of how the various sections of the chemical industry fared in 1957, it was unquestionably a year of progress from the point of view of production, greater efficiency, exports and expenditure on new plants, modernisation, research, etc. Output in the industry expanded at a greater rate than did manufacturing industry generally, and it is particularly significant to note that the slowing down in the expansion rate, evident in 1955 and 1956, was not only halted but a slight improvement was shown.

Despite all that there was a justifiable uneasiness in the industry. Perhaps the most telling barometer of the chemical, or any other industry, is the profitability of its operations. Production may expand, sales may rise and exports may hit a record, but if that is not accompanied by a healthy expansion in profits, then executives have every cause to feel uneasy about the future. As it was, 1957 saw an ever-continuing rise in costs of production, and there can be little doubt that sales expanded because there was a fairly general pegging down of prices.

But there is a limit to which prices can be held, either by sacrificing profit margins or by increased efficiency. One thing seems fairly certain in 1958; manufacturers will be compelled by the credit squeeze to raise prices of certain of their products. That will put salesmanship at a premium in the export markets and those companies that have developed or are developing, new products will probably be in a better position than others.

That the chemical industry is forging ahead, even if at a less profitable level, must mainly be due to the number of large units that are self-financing or which depend on US capital for their expansion projects, and to new plant, started in 1955 or 1956, which is now coming on stream.

The annual report of the chemical and allied trades' section, Manchester Chamber of Commerce (see p. 191) shows the general trend of 1957 and sounds a warning for the future. If studied in connection with the OEEC report on the chemical industry in Europe (CHEMICAL AGE, 18 January, p. 159) and the article on UK chemical exports by Mr. George Brearley (CA, 11 January, p. 99) and the CHEMICAL AGE survey of 1957 (CA, 11 January, p. 87), it will be seen that the UK chemical industry has a sound basis as regards production, exports and plant modernisation.

Such weaknesses as there are, are outside the industry's control: disinflationary policies in the UK, the possibility of a minor recession in the US and the tariff barriers periodically raised by other countries, the latest example being New Zealand. But with their present record, UK chemical manufacturers can look to the future with confidence.

One of the hopes for the year must be that the tighter money policy of the Treasury will come to a successful end. It is difficult to see how production can increase significantly in a period of enforced disinflation, and the danger to the economy of the present policy is that its rigid enforcement for too long may well lead to industrial stagnation. It will take a strong Chancellor of the Exchequer to decide when the time is ripe for a loosening of the shackles.

As it is, the country is still gripped by the vicious circle of rising costs

and a credit squeeze that is designed to halt them, but which also slows down industrial expansion and increased mechanisation, which in the long run are the key to a healthy economy.

HENKEL DISPROPORTIONATION PROCESS

SYNTHESIS of aromatic di- and tri-carboxylic acids by displacement of carboxyl groups was described in a paper presented by Dr. B. Raecke of the research laboratory of Henkel and Cie., G.m.b.H., Düsseldorf, at the annual general meeting of the Gesellschaft Deutscher Chemiker in Berlin on 5 October, last year. The paper has now been published (*Angewandte Chemie*, 7 January 1958).

It appears that in view of the significance of terephthalic acid for manufacture of polyester fibres, workers at Henkel's several years ago considered whether terephthalic acid might be made from salts of phthalic acid by isomerisation.

Although on theoretical grounds this route did not appear too hopeful it was ultimately found that at temperatures between 400°C to 420°C the potassium salt of phthalic acid disproportionated to the salt of terephthalic acid in reasonable yields. The reaction is weakly exothermic.

An inert atmosphere was necessary and carbon dioxide proved satisfactory although other gases as nitrogen, rare gases or inert hydrocarbons such as methane, may be used.

The presence of water must be avoided as also compounds containing active hydrogens such as acids, alkalis, alcohols etc., which promote splitting off of the carboxyl group. Indeed, this is the way to manufacture benzoic acid from phthalic acid. For this reason the phthalic acid must be exactly neutralised in the manufacture of potassium phthalate, for while an acid potassium phthalate as starting material can be used there will be some loss of carboxyl groups. Spray-dried potassium phthalate was used for experiments on a technological scale.

Pressure affects the reaction which, though it proceeds at normal pressure or even in vacuum, is preferably carried out at about 10 atmospheres. It is possible to use in place of potassium phthalate an equimolar mixture of phthalic anhydride and anhydrous potassium carbonate.

The best yield obtained without catalysts was 75 per cent and in order to improve this a number of potential metallic catalysts were systematically investigated. The best results were obtained, it is stated, with cadmium and zinc and compounds of these metals. The effect of the catalyst is to accelerate the reaction and suppress side reactions, for instance decarboxylisation, so that there is a marked gain in yield. On a semi-works scale and using cadmium catalysts, Henkel workers obtained yields of around 95 per cent of theoretical (carbon dioxide pressure about 20 atmospheres). The zinc and cadmium-based catalysts are reduced more or less to the metal during the course of reaction. Zinc or cadmium metals can be used alone or cadmium vapour injected during the reaction. These, together with other observations, led the workers to believe that they were dealing with a gas phase heterogenous catalysis.

The workers investigated other phthalates of the alkali metals and found that although sodium salts gave the same reaction a temperature of about 450° was necessary which is in the range where the organic material is easily decomposed. It did prove possible, however, to replace part of potassium by sodium without impairing yield.

It was found that alkali salts of isophthalic acid could also be converted into terephthalates under very similar reaction conditions. Now though xylene mixtures can be readily oxidised to phthalic acids, separation of the isomers is difficult. The Henkel work indicates, however, that such separation is unnecessary in the manufacture of terephthalic acid. A suitable xylene mixture may be oxidised to a mixture of ortho-, iso- and terephthalic acids, converted into potassium salts and subjected to the new reaction. The result, irrespective of the constitution of the original mixture, is almost exclusively potassium terephthalate.

Since under certain reaction conditions benzoate was also found, the behaviour of potassium benzoate was investigated and it was found that when this compound was heated to about 400°C in the presence of an inert gas it disproportionates to form benzene and potassium terephthalate. Under optimum conditions the reaction is almost quantitative and it may be carried out in a fluidised bed. Since benzoic acid may be easily made by oxidation of very readily available toluene, the process can be seen to be of technical importance.

Henkel workers have considered whether use might not be made of aromatic carboxylic acids containing more than two carboxyl groups as these may be readily produced by oxidation of hydrocarbon mixtures or of coal. It was found that reaction mixtures containing on average two carboxyl groups per aromatic ring provided good yields of terephthalic acid. If the average were higher than two then the reaction products contained a proportion of trimesic acid but with terephthalic acid as the main constituent.

POTENTIALITIES

According to Dr. Raecke, three other firms have been concerned in this research—namely, Hercules Powder Co., US, Imperial Chemical Industries Ltd., and Badische-Anilin und Soda-Fabrik AG, Germany. Indeed, it is stated that all the companies involved have obtained useful data which is now being used in practice. It is understood that ICI reached an option agreement to work the Henkel process with the Henkel company in August 1956. It is believed, however, that ICI are not using the process. Hercules interest in the Henkel process which it is now pilot-planting in the US, lies in the fact that it is regarded by some as a highly economical route to terephthalic acid. Hercules have no captive source of raw materials and, unlike some other US companies, no captive outlet for the product in fibre. However, it would seem that, having toluene available as feed at 4.5 cents/lb. instead of p-xylene at four times this price, and also available from coke ovens and from refineries Hercules feel that making terephthalic acid from toluene rather than xylenes is attractive. The company are therefore using Henkel's disproportionation process starting with toluene, oxidising this to benzoic acid which is converted to its potassium salt. Under heat, two molecules of potassium benzoate disproportionate to produce one molecule of benzene and one molecule of dipotassium terephthalate. This latter is treated with acid to produce the free acid. Hercules then make dimethyl-terephthalate, much of which, it is understood, is sold for Canadian production of Terylene. (*Chemical Week*, 1957, **80**, No. 14, 33.)

Presumably, if ICI had available large quantities of toluene, they too would find the Henkel process of interest.

Badische-Anilin's association in the Henkels' investigations is assumed to be in the use of the fluidised bed, since this company originated the technique.

SLOW DOWN IN EXPANSION RATE WAS HALTED IN 1957

But High Costs May Mean Price Rises

CHEMICAL production again increased in 1957 and the 'slowing down' in the rate of expansion which had been apparent in recent years has been halted. Very favourable comparison could be made with the results of manufacturing industry as a whole. This is stated in the 1957 annual report of the chemical and allied trades section, Manchester Chamber of Commerce, which was adopted at the annual meeting on 17 January.

Taking 1948 as a base year, the average monthly output of the chemical industry during the first eight months of 1957 had increased by 92 per cent, compared with 40 per cent for all manufacturing industry. While the latter figure was identical with the index for the whole of 1956, that for the chemical industry was higher by 7 per cent of the 1948 base figure. Thus, while production in the whole of manufacturing industry had been at about the same rate as 1956, the chemical industry had shown an increase on its 1956 results of 3.8 per cent.

The comparative increases for the three years, 1954/5/6 were respectively, 10.0, 5.4, and 3.3 per cent.

Capital expenditure in the industry continued at a high level and particular reference was made to the development of petrochemicals which, it had been estimated, were now the source of about one-third of all organic chemicals produced in the UK. Extensive developments were planned in this field over the next two years and the possibilities here were most promising. Design of new plant with its emphasis on automation and mechanisation would undoubtedly ensure higher efficiency and productivity, while the enormous expenditure on research would provide new products and processes for many years to come.

Credit could also be taken by the chemical and allied industries, states the report, for the way they had maintained a fair degree of price stability, despite the general inflationary tendency. However, rising costs of labour, transport, fuel and raw materials could not be carried indefinitely by reduced profit margins and the increased efficiency arising from new or modified plant. Indeed some manufacturers have already felt obliged to raise the prices of at least some of their products.

Turning to the export trade, the report says that the latest available figures show an outstanding achievement by the chemical industry. Despite increasing competition from other manufacturing countries, exports for the first ten months of 1957 were to a value of £222.6 million—an increase of almost 11 per cent over the same period of 1956.

Australia, by increasing her purchases from £14.7 million to £18.3 million regained the position of premier market, while in second place was India with £14.7 million —slightly reduced from the £15.4 million for the first ten months of 1956. The other major Commonwealth markets maintained or improved their purchases of UK chemical products. Shipments to South Africa (£10.6 million) and New Zealand (£7.2 million) showed useful improvements on the 1956 figures which were £9.9 million and £6.1 million respectively. Exports to Canada at £6.8 million were almost unchanged.

Many of the non-Commonwealth markets also showed improved figures, although there was a drop in shipments to the US —from £7.3 million to £6.1 million. Perhaps the most spectacular—though understandable—reduction in chemical exports was in the case of Egypt. Shipments to this market during the ten-month period of 1957 amounted to only £33,000, compared with £2.9 million.

The proposed European free trade area continued to be the subject of careful consideration in the chemical industry. The consensus of opinion would appear to be in favour of UK participation, in the belief that the increasing expansion and efficiency of the chemical and allied industries would enable manufacturers to deal adequately with European competition in the vast majority of their products.

Dealing with dyestuffs, the report notes that in general, the level achieved in 1957 by the dyestuffs section was likely to show little change from 1956 although the pattern of trade might have changed to some extent by the extensions in use of the reactive dyes and expanding introductions and production of man-made fibres.

Direct exports of dyestuffs have been maintained but in both the overseas and home markets, profit margins had been substantially reduced by increases during the year in the cost of coal, power and labour and some extension schemes had to be re-phased owing to the credit squeeze.

Overshadowing the immediate future is the uncertainty facing most industries concerned with the general economic situation and the repercussive effects of a trade recession in the US. Towards the end of the year it was apparent that the seasonal drop in activity associated with the Christmas period was exerting an influence rather earlier than in 1956.

Pharmaceutical exports expanded appreciably. At the end of the first 10 months the annual rate, in terms of value, had reached a level of £39.6 million, compared with £35.2 million for the same period of 1956.

The antibiotics as a group were the most significant contributors to this increase, with an expansion of exports of about one-third over the previous year, much of this result being due to growing business in the newer forms of penicillin, and in the more recently discovered antibiotics. Exports of sulphonamides showed an overall decrease in value, one of the main factors being the continued swing of demand towards bulk supplies, in view of the further expansion of formulating and processing plants overseas.

The general decline in world prices for pharmaceuticals which had been such a strong feature of recent years, was to some extent slowed down. The value of export business was also strengthened by the continued expansion of sales of speciality products stemming from British research.

Trading conditions in general, however, were not significantly easier than in the previous year and a particularly heavy blow was the imposition of severe import restrictions by the Indian Government during the second part of the year.

British pharmaceutical interests were much affected by the discussions on the proposed European FTA. In such a highly competitive business, it was inevitable that there should be some misgivings on certain aspects, but the industry as a whole had taken the view that its best course would be to extend full co-operation to the proposed scheme.

In the home market, the steady expansion of business in medical and veterinary products had continued.

At the annual meeting of the chemical and allied trades' section Manchester Chamber of Commerce, l. to r. standing, E. D. Carey (ICI Pharmaceuticals), R. W. Lowe (Charles Lowe and Co. (Manchester) Ltd.), F. Savage (Anchor Chemical Co., Ltd.) Seated, M. Meredith (Monsanto Chemicals), Gilbert Innes, chairman-elect of the section (ICI Ltd.), W. J. Jones (Elliott and Crabtree Ltd.), T. C. Fawcett, retiring chairman, formerly with ICI Ltd.

★ THE CONTROL of aphis at a cost of 7s 6d to 15s per acre is said to be made possible by a new wonder insecticide, Phosdrin, just introduced to the UK market by Shell Chemical. Several outstanding features are claimed for this material which will doubtless be well received by the commercial grower.

Phosdrin, for instance, should silence the concern about the residues of toxic pesticides on food crops at harvest time and sale to the public. It can be applied three days before marketing and subsequently breaks down very rapidly to non-toxic and non-tainting products, leaving the crop after three days, safe for human consumption.

Unlike most other organo-phosphorous insecticides it can be applied at all times throughout the year. It is also said to be the only organo-phosphorous systemic insecticide to give effective control of both aphis and caterpillar.

This is yet another example of expenditure on research and development paying handsome dividends. Extensive trials carried out in the UK during the past two years under the code name OS 2046 have confirmed results obtained by Shell Research workers and others in the US and other parts of the world.

★ 'WHERE does the money go—6?'. Illustrated brochure that accompanied the recent annual report of Scottish Agricultural Industries Ltd., shows a total income for 1957 of £22,745,793.

The brochure shows that this sum was spent as follows: raw materials and supplies, £788 per £1,000 of total income; wages, salaries, pensions and general works and office expenses, £163; taxes, £13; depreciation, £18; other additions to the company's current capital needs, £7; dividends after tax, £8; interest, £3.

★ ATOMIC ENERGY has become one of the largest businesses in both the UK and the US in a remarkably short time. Just how big it is in the US was the subject of a recent talk by Mr. C. R. Tipton of the Battelle Institute, given in Peoria, Ill. He said that US Government spending rose from $14,000 in 1940 to $1,600 million last year. In all about $16,000 million has been spent or appropriated for atomic energy since 1940. Fixed plant investment of the US Atomic Energy Commission is about $6,800 million, exclusive of stocks.

Referring to a recent survey by the Atomic Industrial Forum, Tipton stated that the annual rate of spending in atomic energy may be $2,000 million a year by 1965. The survey sees the breakdown of spending in 1965 about as follows: reactor vessels, $120 million; control apparatus, $80 million; heat exchangers, $70 million; pumps, $104 million; valves and fittings, $40 million; tanks and auxiliaries, $30 million; instrumentation, $70 million; and fuel handing $60 million.

Tipton believes that the business benefits and new business resulting from atomic power would far outweigh the large, single advantage of the additional power that would be made available.

★ A NEW and unique design precision vacuum oven that is likely to interest laboratory workers has been developed in the research laboratories of Tate and Lyle. It was developed during exacting investigations of the difficulties of drying such labile products as sugar syrups and molasses containing fructose (see *Equipment Review*, page 203).

Its wider use is now envisaged wherever precise and reproducible results are sought in determinations of 'loss of weight on heating'. This term is used in preference to 'moisture content,' since it is certain that many thousands of tests are daily performed in laboratories all over the world which report as 'moisture content' changes in weight due to loss of volatile constituents and formation of decomposition products when a sample is 'dried.'

Griffin and Geroge, who are taking up the manufacture of this oven, believe that it will introduce into 'moisture' determination a new order of precision. They say that the first production batch will be available for delivery in April/May 1958.

★ FREQUENT operation of large valves calls for a considerable physical effort by the operator and it is often necessary to bring in additional labour to help in this work. To get over this problem, the chemical engineering division of W. C. Holmes and Co. Ltd., Huddersfield, have recently introduced a new and interesting mechanical method of operating the larger sizes of western valves.

Power is applied by a portable air motor, eliminating all physical effort. One operation can open or close even the largest valve in 30 seconds. This method is not intended to replace the known automatic methods, but is a less costly alternative when full mechanisation is not needed.

★ THE ONLY British firm of chronometer makers to survive the difficult years following the first world war, Thomas Mercer Ltd., St. Albans, are now the largest UK firm producing dial gauging equipment, introduced during 1925-1930. Since the last war, the company has been meeting the demand for a commercial gauge that can determine the fine tolerances called for by modern production, their first air gauge unit being produced in 1950.

Now celebrating their centenary, the company was founded by Thomas Mercer who abandoned plans to emigrate to the US when he entered the chronometer trade. Believing that radical changes were needed in the manufacture of chronometers in this country, he started his own business in London in 1858. He was one of the first treasurers of the British Horological Institute, founded in the same year; his grandson, Mr. T. G. Mercer has held the same office for many years and will this year become chairman.

Mr. T. G. Mercer and Mr. F. A. Mercer, sons of the present chairman, are now responsible for the production of dial gauges and air gauging equipment; they have both spent many years studying all branches of the company's production methods. Despite this modern interest in measuring equipment, the company is still in the forefront of chronometer production.

★ A US Army publication, which has just received security clearance, is likely to interest food chemists all over the world despite the fact that it is couched in non-technical language. It reviews the current state of development of the promising new radiation sterilisation technique for the preservation of foods.

Discussed in it are the principal features of the process, current obstacles to full utilisation, and a history of its development.

The report answers such questions as 'Are radiation sources available?' (yes, but expense is a big problem); 'Can radiations kill the organisms?' (they're lethal to all life); 'Are irradiated foods radioactive?' (no); 'Are they wholesome?' (just as nutritional as heat-treated foods); 'Is special packaging needed?' (with minor modification, commercial packaging appears to suffice).

The report, PB 131171 'Status report to management on radiation preservation of food', may be ordered from the Office of Technical Services, US Department of Commerce, Washington 25, price 75 cents.

★ I WAS interested to hear the forecast this week that the diffraction grating technique would replace the prism in infra-red spectrometers used for process control in chemical plants, oil refineries and in analytical laboratories within a few years. There is no doubt that the use of diffraction grating gives a much higher degree of precision and accuracy.

This forecast was made during the eighth programme in the BBC TV series 'Eye on Research,' screened on Tuesday this week. Viewers saw the technique in use and were told how an inexpensive method had been developed to produce these gratings.

The programme was a timely tribute to the work of the National Physical Laboratory in developing the diffraction grating.

Alembic

CHEMICAL WORK STUDY COMES OF AGE

ABCM's 1957 Harrogate Conference

By R. M. Currie C.B.E.

WORK STUDY should provide an insurance against self-satisfaction. One must not lose sight of the work study principle that the effectiveness of the techniques depends very largely on constant vigilance to see that the improvements effected have been maintained, and that the present state of affairs, however satisfactory, is not made an excuse for failing to seek further improvement.

Viewing the chemical industry as a whole, however, the facts do justify a certain degree of satisfaction.

If we agree that the birth of modern work study in the British chemical industry—i.e. as a broad interest of the industry's own organisation, the Association of British Chemical Manufacturers—dates from the despatch of the heavy chemicals productivity team to the US in 1952, we can say that work study has taken less than a third of the normal time to come of age. If what we claim for the techniques is true, this is only to be expected. The impetus given at the ABCM work study conference at Buxton in 1953 has shown no signs of spending itself. The formation of the ABCM work study advisory service and the publication of 'Notes on Work Study' booklets 1 and 2 were public landmarks. But a better idea of the progress made can be gained from the published proceedings of the conference for senior work study practitioners and works managers held at Harrogate 'in May last year*.

Two Spits Deep

Comparing this volume with the Buxton proceedings, a beginner in work study might prefer the latter. In 1953 we were concerned with explaining the techniques in broad terms, and considering in broad terms likewise their possible impact on various grades of management and employees. The fact that the 1957 proceedings are of a more specialised and technical character demonstrates, surely, that the industry is now tilling the ground 'two spits deep.'

It is particularly significant that two main papers dealt with the application of work study to design: a top executive of a large firm recently pointed out that the impact of work study is travelling upwards from the shop floor to the board room, and it is only natural that companies should go for the massive economies that are possible by taking thought before the first brick is laid. At Buxton it was pointed out that it was easier to correct mistakes with an india-rubber on the drawing board than with a concrete breaker at a later stage—and the lesson seems to have sunk in.

However, three of the papers dealt with the implications of more and more payroll workers being brought into work-measured incentive schemes. I would not agree with anyone who said that this was because the possibilities of the straight incentive scheme had been exhausted; there are still large areas in which the bases of payment are to say the least of it, dubious, where there is still too much guesswork and hence still too much room for unnecessary argument across the negotiating table. The fact, however, that considerable progress has been made in the more difficult areas of possible incentive application does show increasing maturity of the techniques on the one hand and increasing confidence in them on the other.

Mr. Currie is head of the central work study department, Imperial Chemical Industries

The paper devoted to 'Work study in the smaller factory' shows that the association takes regard of the particular structure of British industry, in which the overwhelming majority of firms employ less than 100 people. The success of work study in the larger firms may indeed be partly due to the fact that they can more easily undertake the initial expenditure and compete for the available specialists. The results they can quote are largely a matter of scale, and it would be a great pity if the smaller firms were to be deterred from entering the field because the savings envisaged were a matter of tens or hundreds instead of thousands of pounds. Mr. Howard's paper, and the discussion which followed it, seemed to me to be both hopeful and helpful, and I hope sincerely that the many small firms in the chemical industry will take courage therefrom.

At the time of the Buxton conference I committed to paper some observations on what were the outstanding problems in work study. Reading Dr. Wheeler's introductory paper and those on management and trade union problems by Mr. T. A. Mason and Mr. D. Basnett respectively, I cannot say I felt that all problems had been disposed of. But it would be true to say that the diagnostic character of the techniques appears to have produced results in the field of 'problems,' for in the 1957 proceedings many of them are enunciated more precisely than we could ever have hoped to do in 1952. Let us consider some of the earlier problems for a moment.

We have made some progress in respect of the accuracy and adequacy of the techniques, both by developing new ones such as activity sampling and by arriving at a clearer idea—based on what must by now amount to millions of observations—on the relative suitability of this or that technique to this or that application. On the problem of training, great progress has been made, not only in the extension of facilities for training work study specialists, but in the increasing appreciation of the subject shown by such organisations as the Institution of Mechanical Engineers and the Institution of Production Engineers. Parallel with the introduction of work study as a subject in the syllabuses of these organisations, there has been an increase in the attention devoted to the subject in trade union training activities.

One of the problems in 1952 was how to achieve reasonable uniformity in application. A great step forward was made when a committee of specialists from industry set to work under the auspices of the British Standards Institution to arrive at a common terminology. An interesting sidelight on the work of this committee is that it disclosed quite considerable differences in practice; and whether we achieve a universal vocabulary or not, there is no doubt that the exchange of views was beneficial.

Another problem which has beset firms anxious to apply work study is that of economic justification for the use of techniques at a certain level; six years of experience has been of assistance here, but the chief contribution has been made by the increasing use in work study of mathematical techniques. The statisticians have, in fact, made a great contribution, which incidentally was not covered in any of the papers at Harrogate; the techniques of operations analysis, which is best defined as broad mathematical method study, have assisted very much in bringing to the light of day problems for the work study specialist to solve.

Appreciation Courses

Under the heading of management problems, it seemed to many of us in 1952 that there was a danger that firms would appoint work study officers and leave the rest to them, without any guidance, encouragement, technical advice or, above all, consistent backing from line management. I think we can claim that the holding of appreciation courses early in the campaign to introduce work study in firms has become the rule rather than the exception.

This is partly due, of course, to the good example set by the chemical industry, which has also contributed a great deal by way of both faith and works to the effort to solve another problem—the interchange of information and ideas.

It used to be said that one of the main differences between British industry and that of the US was that the specialist in

* *Proceedings of the ABCM Work Study Conference for Senior Work Study Practitioners and Works Managers. Price 13s. 6d. from ABCM*

America did not feel, as his British counterpart did, that it was *infra dig* to ring up his opposite numbers in other firms to compare notes and exchange details of practice. 'British reserve' has certainly not proved to be the case with work study personnel in the British chemical industry. Moreover, the literature of work study begins to be an embarrassment of riches; and without singling out any particular publication by an individual firm, we must certainly agree that the association's monthly *Productivity News* has made a great contribution to general enlightenment.

Looking back to Buxton I cannot say that there are any problems that were outstanding then that have been completely solved. Certainly human beings have not ceased to be human beings; indeed, thanks to the sometimes unwelcome attentions of the social scientists and psychologists, we know a little more about the nature of human beings and the way they are likely to react to work study application.

This is not to say that the conclusions they have arrived at have been imparted either in a language or a tone of voice which would encourage the work study man on the job to use them. In any case work study people were always extremely conscious of the importance of the human factor, and this is the thread that runs through the whole of the papers published in the 1957 proceedings. That there has been improvement can, perhaps, be measured by comparing some of the things that have been said in the past by trade union writers and speakers with the reasonable, helpful and constructive tone of Mr. Basnett's paper on 'Trade Union problems.'

Finally, let me call attention to one problem which remains substantially unsolved. No matter how much we improve productive efficiency, the full benefit of our improvement will not come to the industry unless the goods are what people want, and unless they are effectively brought to the notice of the people who want them. Dr. Wheeler in his opening address provides me with a closing quotation:

'I believe it is important that we should bear in mind that the principles of work study are as applicable to selling operations as they are to production. We are justified in feeling some measure of satisfaction at the progress which has been made in industry over the last five years, but I believe that we are still relatively ineffective in our approach to selling and in our performance in that field. The importance of the export business to our whole existence needs no emphasis and I make the plea that in the application of work study to the chemical industry, we should not neglect the use of this technique in all other aspects of our business as well as in production. The fact that it is difficult to apply it in some of these other areas is no justification for our failing to do so.'

AERE Commission High Activity Materials Handling Building

A NEW building specially designed for handling highly radioactive materials has just been completed at the Atomic Energy Research Establishment, Harwell. The building is designed to handle radioactive materials at levels up to about 100,000 curies, although by making special arrangements higher levels of radioactivity could be handled in safety.

Components of future power reactors (such as fuel, can and moderator materials) which have been subjected to intense radiation in testing circuits in the materials testing reactors, DIDO and PLUTO, will be prepared for examination and testing in this building. A detailed knowledge of the behaviour of possible components for future power reactor systems under specific irradiation conditions is of great importance for the design of future nuclear power stations: the building will be used primarily to dismantle highly active experimental reactor circuits to provide the test pieces and specimens for detailed examination.

The plant has been designed to do each part of the work as quickly as possible: for this reason particular emphasis has been paid to cell maintenance and to decontamination of the cells. Behind the five cells there is a connected maintenance area which is fully equipped for operation by frogsuited maintenance workers. The plant will normally receive test equipment up to 12 in. across by 12 ft. long but by special arrangements, it is possible to take more bulky equipment inside the line of cells. Active equipment is transported inside lead-shielded flasks, and for this reason a 25-ton hoist is provided at the entrance to the plant.

The spread of radioactive contamination from the cells and the cell-service area to the operating areas of the plant is prevented by a carefully balanced ventilation system. The input and extract sections of the ventilation system are separate and the air pressure in the various areas is controlled in such a way that air always flows into the area of highest radioactivity.

The building was designed and constructed by the Ministry of Works in conjunction with a number of industrial firms to the detailed requirements of an AERE design team. Industrial firms concerned included:

Matthew Hall and Co. Ltd., Dorset Square, London NW1, cell steelwork, cell doors and general piped services; W. E. Chivers and Sons, Devizes, all civil engineering construction; Andrew Machine Construction Co. Ltd., Stockport, ventilation plant; Vokes Ltd., Guildford, air filtration, building and cells; Chatwood Milner Ltd., Shrewsbury, handling bogies for 25-ton transport flask and 8-ton transport flask and cradle for active area; Western Detail Manufacture Ltd., Bristol, cell benches and equipment; Mendip Chemical Engineering Ltd., Ashford, Middx., fibre glass window tanks; Savage and Parsons Ltd., Watford, master slave manipulators; General Mills Inc., Minneapolis, mechanical arm manipulator; George Vernon Sales Ltd., Arlesley, Beds, metrology equipment; John Barnsley and Son Ltd., Netherton, Worcs, 10-ton and 1½-ton electric cranes.

ICI Investments in Indian Dyestuffs

IMPERIAL CHEMICAL INDUSTRIES are to increase investment in India. This was announced by Sir Alexander Fleck, chairman of ICI, in Bombay last week. As was announced in CHEMICAL AGE, 18 January, page 162, Sir Alexander is visiting India, Malaya and Singapore.

The additional investments, Sir Alexander stated, will be made in the chemical industry in the private sector – namely, Atic Ltd. at Bulsar, Bombay State, Alkali and Chemical Corporation of India at Richra, West Bengal, and in a third company, which is a joint partnership concern of ICI and the Indian Government at Gomia, Bihar.

According to Sir Alexander, there are all the possibilities of a 'bigger and better dyestuff industry' in India, and in this development ICI would like to offer the Indian private sector a 'real and vital partnership'.

ICI already have considerable investments in India and are engaged in setting up new chemical plants for three separate companies in partnership or association with Indian capital. When completed (in a year or 15 months' time) these are expected to add £9 million to the total investment in the Indian chemical industry in the private sector. This total may be raised to £12 million by further schemes at present being discussed.

DSIR Grants for Post-Graduate Training

THIS year the Department of Scientific and Industrial Research hopes to make at least as many new awards for post-graduate training as it did in 1957. Last year 649 new research studentships were awarded by DSIR, in addition to those that were renewed for second and third years. Also 152 of the newly introduced advanced course studentships were awarded. In all, 1,453 post-graduate studentships were current at the beginning of the present academic year.

The values of these studentships remain much the same as last year, but the age limits for students qualifying for increased awards because of at least two years of post-graduate experience in industry have been reduced by two years. A student who reaches 24 during the session will receive an extra award of £100 a year; previously he had to be 26 to qualify. Students reaching the ages of 25 and 26 (previously 27 and 28) will have their awards increased by £150 and £200 a year respectively. This has been done mainly to attract those with useful industrial backgrounds to undergo training in methods of research without a considerable drop in salary.

Initial applications for the studentships will be made for a quota of awards for a research school and individual candidates need not be named until later. Full details of the DSIR awards are contained in 'Notes on DSIR grants for Graduate Students and Research Workers,' price 1s 6d (by post 1s 8d), from HM Stationery Office, Kingsway, London WC2.

NUCLEAR ENERGY CONFERENCE

Summaries of Papers Presented at London Meeting

NUCLEAR energy was the subject of a special symposium at the Hoare Memorial Hall, Church House, London SW1 on Tuesday 21 January. The conference (the British Nuclear Energy Conference) was sponsored by the Institution of Chemical Engineers. Sir John Cockcroft presided at the first session and Sir Hugh Beaver, president of the institution, at the second.

The following papers were presented: 'Commissioning and operation of "A" station Calder Hall', H. G. Davey, works general manager, North West Area UKAEA, Industrial Group, Windscale Works, Cumberland; 'The development of the Butex process for the industrial separation of plutonium from nuclear reactor fuels', C. M. Nicholls, chemical engineering division, AERE, Harwell; 'Fission-product disposal', K. Saddington, deputy head of laboratories, research and development branch (IG), UKAEA, Windscale Works, Cumberland; 'Nuclear criticality—a novel factor in the design and operation of chemical plants', C. M. Nicholls, chemical engineering division, AERE Harwell and Dr. A. H. C. P. Gillieson, UKAEA, Risley, Lancs; 'Fuel processing in homogeneous aqueous reactors', J. Wells, chemical engineering division, AERE Harwell and Dr. E. Lofthouse, Widnes Laboratory, research department, Imperial Chemical Industries, general chemical division, Widnes, Lancs; and 'Computation of the performance of a multicomponent solvent extraction system. The separation of uranium and plutonium from fission products by tributyl phosphate', Dr. J. T. Wood and J. A. Williams, UK, AEA, Industrial Group, R. and D. Branch, Windscale Works.

'A' Station Calder Works

EMPHASIS of the paper presented by H. G. Davey on 'Commissioning and operation of "A" station Calder Works' was on the reactor and its associated equipment. No details were given of the more conventional items of plant which follow the heat exchangers.

In commissioning this first reactor measurements were divided into two groups, desirable and essential, and only measurements in the latter group have been made. The information obtained was subsequently supplemented by a more detailed experimental programme during commissioning of reactor 2. Mr. Davey referred in discussing initial loading of fuel and the measurements of lattice constants to experience gained with the first Windscale reactor.

In dealing with measures for absorbing excess reactivity and to minimise flux depression near the top of the pile and loss of output, sufficient channels of steel were installed uniformly throughout the reactor to take up excess reactivity and to minimise the number of control units required.

It was found that excess reactivity of the system without control rods could be estimated quite accurately from experiments during initial loading to criticality and it was posible to estimate the neutron absorbing capacity of the control rods. This was found to be higher than was expected from theory, so it was decided to install 52 rods instead of 72. Finally it was found that 48 were best.

Mr. Davey stated that this calibration was extremely difficult at Windscale, but Calder reactors have the advantage of a closed pressurised cooling circuit. At Windscale, there is a once-through system with discharge of air coolant to the atmosphere. The Calder reactor is maintained in a critical condition by adjusting the air pressure in the pressure vessel, so that neutron absorption of the nitrogen present in air balances the loss of absorber due to withdrawal of the control rods.

Tests were made at the completion of control rod calibration for gas flow rate through each individual channel. This is chosen to be such that the maximum temperature in the channel is close to the permissible limit of 408°C.

Gas leakage, which initially was at the rate of 100 lb./hr. was approximately halved by tightening, and, in some cases, by repacking valve joints and glands, particularly in the ancillary pipe-work associated with the carbon dioxide supply and instrumentation. Leaks were located by painting suspected units with a teepolglycerine solution.

Blower tests and gas circuit inspection were carried out. During tests with the burst cartridge detection gear, it became apparent that it was necessary to install a small feed of inactive coolant gas to the sampling gear to minimise the effects of a relatively high background in the activity detection unit due to gaseous argon 41 activity.

After work-up to power operations, operation at power began. It was found then that neutron flux distribution did not agree with the theoretical predictions so that the central channels were being overcooled, with resulting low outlet temperatures. Blower speeds were increased beyond those predicted for specified powers. It was also found difficult to hold down the gas return temperature to 140°C owing to the low mean temperature difference across the heat exchangers, with resultant overloading of the heat exchanger LP system. Adjustments to the relative positions of control rods did not produce any appreciable improvement.

During the first shut-down on 5 November, 1956, after the official opening on 17 October, 1956, a small amount of absorber was loaded to compensate for the increase in reactivity due to build-up of plutonium. On restarting the plant a power of 180 mW was achieved with an electrical output of 42 mW on increasing the maximum cartridge surface temperature to 400°C. Owing to the relatively low gas outlet temperature, this power necessitated the blowers running at maximum load, so that in fact net electrical output was less than designed.

At the second shut-down, the channel flow pattern was adjusted. Cartridges loaded during refuelling had their tops fixed by a locking spring and fitted with a magnox brace to prevent bowing which occurred. Subsequent operations have shown that modifications made have been satisfactory and near-design conditions have been obtained with an electrical output of 42 mW at a heat output of 180 mW with a maximum cartridge temperature of 408°C.

Commissioning of reactor 2 began in December, 1956, and full operation by February, 1957. Reactor 1 has been in operation for over 12 months and has proved to be a 'flexible and reliable unit which lends itself to routine control.' The next phase is minor modifications to increase output, and possibly some simplification in instrumentation and regrouping of instruments.

Value of Computation in Uranium Separation

ESTABLISHED methods of graphical calculation for immiscible phase have been applied to a complex multicomponent solvent extraction system—namely, the first extractor of a tributyl phosphate process for irradiated uranium. These and partition co-efficients for the main components were presented by Dr. J. T. Wood and Mr. J. A. Williams in their paper on the 'Computation of the performance of a multicomponent solvent extraction system—the separation of uranium and plutonuim from fission products by tributyl phosphate.'

The value of partition co-efficients in the calculation of extractor performance was demonstrated and typical results of calculations were illustrated. From the behaviour of industrial components, the choice of operating conditions was determined.

Conclusions drawn by Wood and Williams were that while the broad outlines of a process could be calculated by the means described in the paper, it was emphasised that a reliable prediction of performance could only be made when all the partition data required were available. Where there were several compounds of an element in equilibrium, as

occurred, for example, with plutonium and ruthenium, their kinetic data might have to be considered in addition to normal partition data. At present, it was sometimes more satisfactory to obtain detailed information by experiment under conditions closely approximating, with respect to time of residence and flow ratios, to those of the plant.

Butex Process for Plutonium Separation Explained

THE CHEMICAL engineering work carried out in Canada in developing the Butex process was discussed by Mr. C. M. Nicholls in 'The development of the Butex process for the industrial separation of plutonium from nuclear reactor fuels.'

It had been necessary to obtain considerable process development information before a radioactive pilot plant could be designed and operated. Some small scale experience had been obtained in (a) dissolution of uranium in nitric acid; (b) continuous solvent extraction process with dibutyl carbitol (diethylene glycol dibutyl ether) as the first choice of solvent, hexone (methyl *iso*-butyl ketone) being the second choice; (c) some knowledge of the behaviour of uranium, plutonium, and fission products at equilibrium under selected conditions of extraction.

Process Criteria

A preferred process possessed, in addition to earliest elimination of most of the fission products and their associated radioactivity, advantages over alternative processes in that the fission product stream would be practically free from dissolved salts and so could be concentrated by evaporation before storage. Also vessels, pipes and the first column would not contain high concentrations of salts with the consequent possibility of blocking due to crystallisation.

Column studies with uranyl nitrate were carried out to study mechanical design details of solvent extraction, to provide information on extraction performance of columns and to check the flow sheet as far as possible with uranium.

Some of the column investigations were repeated in studies with uranyl nitrate solutions containing trace amounts of plutonium. It was found that the toxicity of plutonium necessitated considerable modifications to the equipment and building in which the work was done. The results obtained showed that under the conditions of extraction used, column 1 designed to extract uranium would completely extract the plutonium. Although equilibrium experiments had shown hydroxylamine to be a satisfactory reducing agent for plutonium, its use was not successful in column runs. Ferrous sulphamate, however, proved to be so rapid in action that the plutonium could be reduced in the column and an earlier reduction step was unnecessary. Separation of uranium and plutonium in column 2 was shown to meet the required specification.

From the primary separation process, the four following streams would result:

(a). *Fission products from column* 1: Efforts were designed to develop a process giving an effluent from column 1 that was virtually free from salts so that concentration of fission products was possible.

(b). *Uranium stream from column* 3: Uranium in the aqueous phase from this column had to be recovered in a form suitable for re-use by uranium metal plants;

(c). *Solvent Stream*: Solvent from columns 3 and 5 had to be re-purified for recycling in the process. Washing with aqueous, alkaline solution proved convenient for removing most of the contaminants prior to final recovery by distillation.

(d). *Plutonium stream*: Column 2 stream, which was almost saturated in ammonium nitrate, was very dilute in plutonium.

It was decided to use a further extraction solvent cycle after oxidation of the plutonium to the more extractable four-valent state. Sodium dichromate proved a satisfactory oxidation reagent. In the extraction and stripping cycle a ten-fold volume reduction was possible with practically complete plutonium recovery in columns of 15 ft. to 20 ft.

The pilot-plant operation process represented a considerable advance over the earlier US precipitation and Canadian 'Trigly' processes. It was a continuous process giving separated plutonium, uranium and fission products. The fission products were obtained in a form suitable for concentration by the acceptable technique of evaporation and the plutonium streams were in a form suitable for further purification.

Mr. Nicholls stated that the US Redox process shortly preceded the Butex process. The Redox process gave better fission product decontamination in the first column than did the Butex process but had the disadvantage of a column 1 fission product effluent almost saturated in salts.

The object of the pilot plant was to develop and prove the process. As the plant was to have only a limited life, extemporisation in selection of equipment was allowed. Semi-rigid Saran plastic tubing was widely used and comparatively little welded stainless steel tubing.

During active operation of the plant the effects on performance of several variables were studied. These were: Acidity of dissolving; position of feed entry to column 1; ratios of flow-rates of solutions fed to the columns; concentration of salting-out agent and acidity; neutralisation of solvent from column 1; reduction and oxidation of plutonium; solvent purity; plant operation; and extraction performance.

With regard to solvent purity, Mr. Nicholls reported that impurities in commercial dibutyl carbitol produced a slight reducing action on plutonium which was overcome by washing the solvent with an oxidising agent. Fission products, uranium and plutonium contaminants, were eliminated from recycled solvents by alkaline washing and distillation. Recovered solvent was repeatedly re-used without deterioration in extraction performance.

Results representative of the best obtained were: ex column 3 (columns 1, 2 and 3 overall separations) uranium recovery, 95.4 per cent (99.9 per cent possible); ex column 5 (columns 1, 2, 4 and 5 overall separations) plutonium recovery, 98.8 per cent (99.9 per cent possible). Further oxidation, extraction and stripping cycle on column 5 product, increased PuDF$\beta\gamma$ to 9 x 10^4 and PuDFα to 2 x 10^4.

Development of production-scale equipment was undertaken by a team from Imperial Chemical Industries Ltd.

Experience was gained in operating a radioactive plant and a considerable amount of information was obtained on analytical methods for controlling the process.

Nuclear Criticality

A CRITICALITY accident with fissile materials could lead to hazards to operators and costly damage to plant. After a brief review of the relevant neutron physics, Mr. C. M. Nicholls and Dr. A. H. C. P. Gillieson in their paper 'Nuclear criticality—a novel factor in the design and operation of chemical plants' considered methods for the safe design of geometrically simple, isolated solution systems. It was shown how this could be achieved by limitation of mass, volume, and concentration of fissile material in solution or, preferably, by selection of the shape of the plant.

Geometrically complex systems were discussed briefly with particular reference to general design considerations.

It was stated that, in general, criticality would be less easily avoided in 'wet-way' than in 'dry-way' processes. A 'wet-way' process with all the critical limitations of aqueous plutonium solutions was the standard method for the separation of plutonium from pile-irradiated uranium, where the metal is dissolved in acid and then separated by solvent extraction. In a recently described 'dry-way' method irradiated uranium was melted and the plutonium extracted into molten magnesium. The magnesium-plutonium alloy was separated from the uranium together with most of the fission products. To obtain the plutonium, magnesium was distilled away. As the criticality limitations in such a plutonium alloy are not so severe as in the 'wet-way' process, larger quantities could be handled at a time.

Owing to pressure on space, summaries of other papers have been held over until next week.

Battelle Institute Publishes New Developments

RECENT investigations by the Battelle Institute have been released. Short notes on these developments are given below. They include the use of indium oxide as a de-icing coating, an improved nitrile rubber and the preparation of dense beryllium oxide.

De-icing Coating

Technologists at Battelle Institute have developed an improved de-icing coating for airplane windshields. Such conducting coatings are not unknown, but previously, transparency equal to that of the Battelle coating could not be achieved at temperatures below about 800°F. Battelle technologists, however, have developed a coating technique that employs the relatively low temperatures between 250°F and 400°F. At these temperatures, which do not cause distortion of the glass, the process produces highly transparent coatings.

Starting with the soft metal, indium, a coating of indium oxide is produced which is stated to form an excellent, transparent film on the glass. The coated glass transmits about 85 per cent of the light that strikes the glass. Also, the film can be heated electrically to a temperature high enough to boil water. The film, though microscopically thin, is mechanically durable.

Improved Nitrile Rubber

Search for a rubber composition with increased resistance to diester-type lubricants at 350°F has been made at Battelle. One of the types of rubbers included in this investigation was the nitrile type.

While this type did not swell excessively, it cracked and degraded drastically after 72 hours' exposure to hot diester lubricant. R. A. Clark and W. H. Gillen of Battelle now report that a magnesia-loaded nitrile rubber compound has been developed at the institute which has better diester-resistant properties than were previously available in such compounds. The new composition has withstood severe ageing conditions for 168 hours before surface-cracking occurred.

Dense Beryllium Oxide

Beryllium oxide is notable among ceramics for its superior refractoriness, high thermal conductivity, and effectiveness as a nuclear moderator. Interest in BeO ceramics has been limited, however, by the difficulty of fabricating the dense high-purity shapes desired for nuclear-reactor service. Research at Battelle Institute has led to the development of high-purity active BeO powder that is easily fabricated into shapes of near-theoretical density under conditions well within the range of conventional ceramic practice. (Hyde *et al., Nuclear Engineering,* Pt. IV, Chemical engineering. Progress Symposium Series No. 19 V.LII. Amer. Inst. of Chem. Engineers, P. 105.)

Powder compacts prepared from activated BeO had near-theoretical density (3.01 g. per cm.^{3}) when sintered in hydrogen at only 2,500°F. In addition the BeO ceramics sintered at this low temperature were found to have unusually high-bend strength (28,000 p.s.i.) and fine-grain structure. The active BeO was prepared by carefully controlled calcination of certain commercial hydroxides.

New High Performance Insecticide from Shell Chemical

PHOSDRIN, a new organo-phosphorous insecticide from Shell Chemical Co. has been marketed to meet the need for a systematic material that will control aphis and caterpillar and which can be applied to vegetable crops up to as little as three days before marketing. As phosdrin breaks down rapidly into harmless components after application, crops can be eaten with safety after this period. A rapid and high kill of aphis and caterpillar on top fruit is also claimed and Phosdrin is said to be the only organo-phosphorous insecticide to give an effective dual control of these pests.

It contains not less than 60 per cent weight of alpha isomer of 2-carbomethoxy-1-methylvinyl dimethyl phosphate (100 per cent active). The new material is the result of extensive research and trial work in the UK and overseas.

Phosdrin kills by contact, fumigant and systemic action and is said to be economic, rapid and efficient in its results. It may be applied at any time, and the recommended safety precautions have been Ministry-approved.

Because of an extremely thorough and quick initial kill it is said that a build-up following reinfestation is unlikely to occur for some time after spraying. The material is potent and only 2 oz. per acre (30s for a 4 oz. bottle) are needed to control aphids and 4 oz per acre for caterpillars and certain other pests. More than 60 per cent of the Phosdrin has been found to be absorbed into the plant within 30 minutes. It subsequently breaks down rapidly to non-toxic and non-tainting products.

Phosdrin is compatible with many fungicides, although these do not include Bordeaux mixture or lime sulphur.

Mond Nickel Fellowship Awards

The Mond Nickel Fellowships Committee have awarded a Fellowship for 1957 to Mr. E. J. Williams, of John Summers and Sons, and Mr. R. J. D. Acheson, of Mufulina Copper Mines.

Applications are now invited by the Committee for Fellowships of an approximate value of £900 to £1,200 for 1958. Particulars are available from 4 Grosvenor Gardens, London SW1.

UKAEA Salary Claims

VINYL ESTERS of fatty acids copoly- £2,350 a year for 8,000 scientific and technical employees of the UK Atomic Energy Authority were lodged on 20 January by the Institution of Professional Civil Servants.

In a letter to Sir Edwin Plowden, Chairman of the AEA, Mr. S. Mayne, secretary of the IPCS referred to the recent Fleck report and its remarks on the shortage of qualified staff. Mr. Mayne points out that the authority should not be bound to relate its salary scales with those in the Civil Service; this, he says, has led to the AEA's 'inability' to recruit and retain staff.

IPCS claims increases ranging from £2,550 to £900 a year for 250 senior scientific grades, and rises varying between £940 and £35 a year in other grades. In the case of the senior grades, these represent between 75 and 44 per cent increases, in the others between 64 and 9 per cent. The claims would raise the minimum in the top scientific grades from £3,150 a year to £5,500. The Institution also suggests that university entrants with honours degrees should begin at £900 instead of the present £645.

Lecture on Vitamins

THE Chemical Society is to hold a lecture on 'Some recent advances in the chemistry of the vitamins D' on Thursday 13 February at 7.30 p.m. It is to be given by Professor B. Lythgowe in the large chemistry lecture theatre, Imperial College, London SW7.

US Interest in Lead Fluoride Crystals

SOME seven years ago, the first lead fluoride crystal was produced at Aberdeen University in the department under Professor R. V. Jones. Since then a number of other lead fluoride crystals have been made, the largest weighing several pounds. Samples of these crystals have been sent to the US, France and other universities in Britain, but to date, it is believed, the crystals have not been produced elsewhere.

Lead fluoride crystals can be used for measuring radiation at atomic power plants and also for the manufacture of 'windows' for inspection of nuclear reactors.

It is understood that the Americans wish to obtain a heavier crystal for use in nuclear investigations at the Massachusetts Institute of Technology, and so Professor Jones is this week flying to Washington, to discuss with leading US atomic scientists research developments which his department has made.

Gift from ICI

Imperial Chemical Industries Ltd. have given the Manchester College of Science and Technology £20,000. It is to be spent on expanding the departments of chemistry, chemical engineering and mechanical engineering to enable them to take more students. The money is to be paid over a period of five years.

New Biochemical Research Unit for British Glues

Mr. Harold J. Cotes discussing the operation of an ultracentrifuge with Dr. R. H. Smith, head of the biochemical department

NEW laboratories of British Glues and Chemicals Ltd. were opened at the group's Bermondsey, London, factory on 20 January by the chairman and managing director, Mr. Harold J. Cotes. The laboratories are an extension of those already in use by the research and development departments, and in addition house the newly-formed biochemical research department.

Before unveiling the plaque which records the official opening, Mr. Cotes summarised the history of the department and paid tribute to the speed and effectiveness of its work.

After the opening ceremony the chairman and executives of the group toured the laboratories. Explanatory comments were given by the director of development, Mr. I. H. Chayen, the technical controller, Dr. D. R. Ashworth, and the head of the biochemical department, Dr. R. H. Smith.

In the past the work of the group's existing research and development departments has resulted in many new processses for the manufacture of high quality glues and gelatines, the introduction of new raw materials, and the Chayen process for the cold water rendering of cellular material.

The opening of the biochemical laboratories marks a new stage in the development work of the group. Here the most up-to-date experimental methods of protein-chemistry and biochemistry have been established, and these are proving of immense help in the day-to-day running, and sometimes in the improvement, of existing processes. The main role of the biochemical department, however, is to uncover new facts about collagen—its formation and degradation—which must be the basis of any future improvement in the production of glues and gelatines.

Chairman and director of British Glues and Chemicals, Mr. Harold J. Cotes, opening the new research laboratories

New Regulations for Work in Compressed Air

REGULATIONS which require special measures to be taken to protect the health and safety of men employed on work in compressed air will come into operation on 21 April. Entitled 'The Work in Compressed Air Special Regulations, 1958,' they are obtainable from HM Stationery Office or through any bookseller, price 8d net, 10d post free.

The new regulations are designed to ensure that close attention is paid to the health and safety of those working in compressed air and, in particular, that correct control and supervision is exercised over procedures, both in compression and decompression. Detailed rules for these procedures are contained in a schedule to the Regulations.

Electrical Equipment for Nangal Fertilisers

A £1.5 million contract has been awarded by Nangal Fertilisers and Chemicals (Private) to the English Electric Co. for the supply of electrical equipment for an electrolyser plant at Nangal, north-west of Delhi.

The equipment will supply d.c. power to electrolytic cells used to produce both hydrogen for the adjacent fertiliser factory and heavy water. Total electrical load is expected to amount to about 176,000 kilowatts, and will be the largest in India to be supplied by rectifier equipment.

Consultants for the project are Vitro Engineering Corporation of New York.

Water-Resistant Cement Marketed

Now being manufactured under licence by the Rugby Portland Cement Co., is Petacrete, a new type of water resistant cement developed by Petacrete Cement. The cement is claimed to be resistant to deterioration by atmosphere, moisture or water, thus making it particularly suitable for use in the tropics, and to give a better finish than ordinary cement.

Development work has taken eight years and the Rugby Portland Cement Co. have had Petacrete under test for 15 months. The cement is mixed normally, mechanical abrasion breaking up the protective coating of the chemical additive which prevents hydration.

Cost of Petacrete in this country is 10d. or 11d. more per bag than normal Portland cement. It can be stored indefinitely, however, without deterioration. For abroad, the cement can be shipped in bags instead of special drums, thus reducing the net cost.

Wood Tar as Tinplating Additive

RESULTS of research into the use of wood tar as an additive to tinplating solutions were described by Dr. E. S. Hedges, director of the International Tin Research Council, in the course of an address to the Royal Institute of Chemistry in Birmingham on 21 January.

Addition of small quantities of wood tar to the solution, Dr. Hedges told the meeting, results in a bright finish being given to the tin coating, which, by the normal process, is usually matt. Experiments are continuing to discover the constituent of the tar which causes this bright finish, but sufficient results have been obtained to show that this new bright plating process is a practical proposition.

Seven commercial firms are using quantities of the new additive for trials at their own works. Electrical equipment and instrument parts are among the products which would benefit especially from the new process.

ICI Extend Scheme for Fellowships

POST-GRADUATE fellowships donated by ICI for research in chemistry, physics, engineering and related sciences have been extended to cover all British universities. The number of fellowships will be increased from 92 to 103 and will range in value between £700 and £1,000 a year, averaging £900. The scheme is guaranteed for five years.

Universities brought within the scheme for the first time are:—Aberdeen, Belfast, Bristol, Exeter, Hull, Nottingham, Leicester, North Stafford, Reading, Southampton, St. Andrews, Sheffield and the Trinity and University colleges, Dublin.

Cost to ICI will be approximately £93,000 a year, and the total contribution to scientific education and research in the UK will now be more than £300,000 a year.

Overseas News

UNION CARBIDE CANADA PLAN MORE NEW FACILITIES FOR 1958

INDICATIONS regarding business of Union Carbide Canada are stated by A A. Cumming, president, to be at about the same level in 1958 as in 1957. Expenditures on new construction will continue at a high rate of activity during the next year.

Sales of carbon products are affected by conditions in such industries as metals, abrasives, chemicals and also by the dieselisation programme of the railways. The company's domestic sales picture looks for a moderate increase, with exports remaining about the same as in 1957.

In the industrial gas field, expectations are that the company's business will be sustained at existing high levels and sales will approximately equal those in 1957. New units to produce tonnage oxygen, liquid oxygen and argon are nearing completion and will be in operation during the summer. Also to be completed in a few months is an expansion to the company's apparatus factory, where gas producing and distributing apparatus and welding and cutting apparatus are manufactured. This latter expansion will permit the manufacture in Canada of a number of products which previously were imported from the US.

So far as plastics are concerned, polythene resins are again expected to show substantial gains in sales in 1958. The company is expanding the productive capacity of its polythene plant. Silicones will also see gains in sales; phenolic plastics, which are closely tied in with activity in the appliance field, are expected to be about the same as in 1957.

Mobile Liquid Oxygen Plants for Rocket Sites

A SERIES of mobile liquid oxygen plants have been designed by Air Products Inc. for the US army to use at guided missile launching sites. Largest of the plants can produce 20 tons of 99.5 per cent liquid oxygen a day. The only on-site requirement is diesel fuel, a half-pound of which makes a pound of liquid oxygen. No cooling water or chemicals are required and the plants can operate in outdoor temperatures ranging from —25° to 125°F.

The whole plant is mounted on four semitrailers, each measuring 8 by 30 ft. and some 11 ft. high. Two of the trailers mount a 1,200-h.p. air-cooled diesel engine and rotary-type compressor. This will compress air to 100 p.s.i. Space is left to include an electric generator so that the diesel engines can be used to produce power.

Compressed air from these units is fed into a heat exchanger on a third trailer. Here, intensely cold by-product nitrogen, passing back from further stages of the process, cools the air. Water vapour, carbon dioxide and other impurities are frozen out. Air is periodically rerouted through alternate passages while a blast of nitrogen ejects deposited impurities. Again the air is produced in almost liquid form. It passes to the fourth trailer, where it is partly liquefied by heat exchange with discarded nitrogen gas. Still unliquefied air is removed by a centrifugal separator; the liquefied air is then subcooled and passed into a distillation column. The remaining gaseous air is returned to the heat exchanger unit partially reheated and reprocessed through an expansion turbine. Nitrogen is distilled from the column and is returned to cool the liquefier and heat exchanger. Liquid oxygen stays in the column as product.

An instrument panel is mounted on a graphic control panel in the back of the distillation trailer for easy monitoring.

AEC Lease U235 to Argentina

Argentina is to be leased 6 kilograms of uranium 235 by the Atomic Energy Commission for use in the research reactor at present under construction there. One of the Commission's specialists in installation of nuclear plant for industrial use has arrived, on a three-year consign- of uranium 235 by US Atomic Energy AEC.

New Foam Stabiliser

A new foam stabiliser and hair softener, 'Glycomul', is now being marketed in commercial quantities by the US company of Glyco Products. Used alone, it is of value as a lotion base for thioglycollates, calamine, zinc oxide, phenol, sulphur, ammoniated mercury, ichthammol and camphor. It is stable to mild alkalis, acids and salts at normal temperatures. When used in the presence of a weak acid such as phosphoric it is of value as a softener and anti-static agent for use on the hair. Samples and prices of Glycomul are available from Glyco Products Co., Inc., Empire State Building, New York 1, NY, US.

Du Pont Close Canadian Cellulose Sponge Plant

Du Pont of Canada are to discontinue production of cellulose sponge at their Shawinigan Falls, Quebec, plant, because the Canadian-made product cannot compete with the increasing flow of imports entering Canada. Instead the company will supply the Canadian market through the resale of US sponge.

Iran Seeks Tenders for Sulphuric Acid Plant

From the Chemical Institute, Ministry of Agriculture, Avenue Ferdowsi, Bank Street, Tehran, has come a call for tenders for the erection of a factory for sulphuric acid production. The institute seeks a complete set of specifications for extracting 52° Baume sulphuric acid (or 66° Baume to be diluted up to 52° Baume) from sulphur mineral ore containing 45-60 per cent pure sulphur. Capacity sought is 10 tons per 100 per cent acid each 24 hours of operation.

Equipment sought is: two reservoirs with capacity to store two months' output; 200 iron drums with a capacity of 200-250 litres each; electric motors (a.c., 3-phase, 380 volts, 50 periods, 0.8 co-efficient) plus transmissions and belts, in iron internal construction and iron steps; all spares and enough lead sheets and pipes, washers and other parts for two years' operation. Quotations have been called for by 19 February with offers based on c. and f. the Iranian port of Bander Shapur.

Chilean Nitrate Sought by W. Germany

A Bill was introduced last week by the West German Parliament asking for authority to import annually 50,000 tons of Chilean nitrate tariff-free. Tariff-free Chilean nitrate was imported for the first time last year.

An ICIANZ Subsidiary's Deal

A subsidiary of Imperial Chemical Industries of Australia and New Zealand, Balm Paints Pty. has acquired the Australian interests of Goodlass Wall and Co. Pty. and Alexander Fergusson Pty.

Plastics-coated Glass Process

A French process which involves a new method of applying plastic coatings to glass fibres is the subject of British patent No. 781,489. It depends on the use of a mixture containing a di-ethylene urea plastic compound as a preliminary undercoating. The coated fibres are then treated with an organic di-isocyanate compound and finally coated with the plastic resin desired.

The process is stated to be applicable to either glass fibres or woven glass-fibre fabrics, and it is claimed that the plastic coating does not break away from the fibres to which it has been applied.

Uranium Production in Australia

Australian Territories Minister, Mr. Paul Hasluck, reports that the Rum Jungle uranium workings in the Northern Territory of Australia produced 541,652 lb. of uranium oxide last year. Apart from Rum Jungle production, the value of uranium-bearing minerals from the Northern Territory in 1957 totalled £A.475,000.

Freezing Method to Remove Salt from Water Studied for Navy

A mechanical compression method has shown promise for removing salt from ice made of brine, according to a final report of Navy-sponsored studies of freezing salt water to obtain fresh water. Of the many mechanical methods for separation of pure ice crystals from a saline solution, compression appeared to be the only one with possibilities of reducing salinity in a single step. The method also appeared

adaptable to a relatively simple production unit. Other methods studied were blowing with air, vacuum washing, draining, and selective freezing. Some reduction of salinity was indicated for all the methods. They would require, however, more than one stage of freezing.

The report (PB 121959 'Investigation of freezing as a means of obtaining fresh water from salt water') has been prepared by E. N. Kemler and others, University of Minnesota, for the US Naval Civil Engineering Research and Evaluation Laboratory. It may be ordered from OTS, US Department of Commerce, Washington 25, price $1.50.

Synthetic Resin Plant for Philippines

The Casco Philippine Chemical Corporation, PO Box 160 Manila, who are associated with the Borden Co., US, recently inaugurated their new synthetic resin plant. The first of its kind in the Philippines, the bulk of its production will be supplied to the plywood industry.

Brazilian Chemical Imports Increase

According to official Brazilian statistics, the volume of imports of chemical and pharmaceutical products rose to 356,000 metric tons in the first half of 1957, as compared with 292,000 metric tons in the first six months of 1956. The value of these imports rose, however, only from $63 million to $69 million in the above periods.

Chemical Utilisation of Sulphur Being Studied in Sicily

In the course of their study of various possible solutions that could alleviate the crisis now besetting the Sicilian sulphur industry, Italian Sulphur Board (*Ente Zolfi Italiano*) are stated to be devoting a good deal of their attention to the possibility of processing sulphur ore on the spot to obtain chemical products that fetch more in the market than the ordinary sulphur. A number of contacts with chemical firms in other countries is therefore being made in this connection. Recently the board had visits from representatives of Hochtieg, Rheinstahl, Salegitter, and Sodeine.

Licence for Indian Dyestuffs Company

During July, 1957, a statement was issued by the Indian Ministry of Commerce and Industry which gave details of licences which had been granted for development of the Indian dyestuffs industry. Recently it has been announced that National Chemical Industries, Najafgarh Road, New Delhi, have been granted a licence under the Indian Industries (Development and Regulation) Amendment Act, 1956, for the manufacture of 100 tons a year of naphthols and 100 tons of fast bases.

Early Production of Goodrich's Natsyn Expected

Goodyear Tire and Rubber, US, have begun pilot plant production at Akron of their new synthetic rubber, Natsyn, a combination of natural and synthetic. They expect to start engineering a production plant soon with an annual capacity of 25,000 to 30,000 tons, and to be producing commercial quantities in the near future.

Both B. F. Goodrich and Firestone Tire and Rubber are claiming to have developed the molecule of natural rubber in their laboratories and to have pilot plants in operation.

US industry sources, however, are reported as saying that Natsyn and similar synthetics will not be competitive in price with natural rubber if the price of natural rubber is steady at about 30 cents per lb. Commercially produced natural-type synthetics are, it is understood, unlikely to be produced for less than 35 cents per lb. because of the high cost and scarcity of the basic material, isoprene (25 cents per lb). Isoprene is being produced by Esso Standard Oil, US, only on a laboratory scale.

Chinese Fertiliser Expansion Forecast

Chinese output of ammonium sulphate in 1957 is estimated at 755,000 tons. It is claimed that when the construction and expansion of eight factories provided for in the first five-year plan is completed, 1,800,000 tons of nitrogenous and 600,000 tons of phosphatic fertilisers will be produced a year.

Ductile Ceramics

Ductile ceramics are reported by research workers, headed by Professor Earl R. Parker, at the University of California, US. Single crystals of some ionic solids with cubic crystal structure have been found to have substantial amounts of ductility. Some of the materials examined are: KCl, NaCl, LiF, CsBr, AgCl, and MgO. MgO is stated to be best for a high temperature structure.

Professor Parker states that ductility depends on the ability of planes within the crystal lattice to slide past each other under stress. Duty materials with a simple structure will work and only materials with one cation per anion have worked to date. Key to ductility is said to lie in having cations and anions end up in the same positions relative to each other that they had before they slid.

Ductility, in many instances, is fleeting. When surfaces of certain crystals are fresh the crystals can be bent, but even in a short period of time, this may be gone. Potassium chloride, it is reported, can be kept ductile if the surface is protected by treating it with ammonia or kept away from nitrogen and oxygen. Lithium fluoride and caesium bromide, however, do not 'age' at all.

Basic investigations to be carried out will be: cation size; anion size; surface effects; and internal effects (impurities). The project is being financed by the US Air Force Office of Scientific Research.

Severe Slump in Australian Rutile

Sharp slump in the price of Australian rutile has taken place. The price now is £A40 a ton, compared with £A120 to £A140 in 1955 and 1956. Most Australian rutile exports went to the US before defence cuts resulted in a lessening of demand. One large producing company has ceased to operate its plant temporarily, and other new companies have been compelled to revise their plans. Only three firms are expected to stay in business.

Salt Plant in Ceylon

National Salt Corporation of Ceylon is to implement a new scheme for the manufacture of 500.000 tons of salt and gypsum yearly at Hamantota in the south of the island. Estimated capital of the project is Rs.8 million (approximately £1,050,000).

Pine-gum Derivatives in Polymers

Presaging wider use of research-developed chemicals from gum turpentine as catalysts in the production of polymeric materials, including synthetic rubber, the US Department of Agriculture has granted a licence to the American Cyanamid Company, New York, for use of a government-owned patented process involving derivatives of turpentine. American Cyanamid was previously licensed to use a companion Department of Agriculture patent covering methods for making the pine-gum chemicals themselves.

The patent on which the new licence has been granted is US No. 2,775,578, 'Polymerisation initiated by saturated cyclic terpene peroxides.' The earlier licence is based on US Patent No. 2,735,870, 'Peroxides of saturated cyclic terpenes and method of producing same.'

One of the widest and most important applications of the government-developed turpentine chemicals is the use of paramenthane hydroperoxide as a catalyst in the manufacture of S-type cold rubber. Paramenthane hydroperoxide and other peroxides prepared from gum turpentine are used also in the production of other polymeric materials, such as polyester resins. Current production of these pine-gum derivatives is estimated at more than two million lb. a year.

Patent No. 2,775,578 specifically describes procedures for using pinane hydroperoxides and paramenthane hydroperoxide as catalysts in the process of manufacturing synthetic rubber. The patent also provides broad coverage for 'polymerising polymerisable unsaturated organic compounds' through use of 'a saturated cyclic terpene hydroperoxide' such as pinane hydroperoxide or menthane hydroperoxide. These chemicals may be used for the polymerisation of a wide variety of compounds, including conjugated butadienes; alkenyl aromatic hydrocarbons, such as styrene; chlorinated materials, such as chloroprene; acrylic and substituted acrylic esters and nitriles, such as acrylonitrile; and mixtures of these and similar compounds. They are suitable for solution, bulk, or emulsion polymerisation.

EQUIPMENT REVIEW

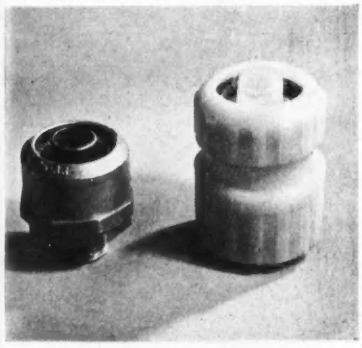
Chemical Plant : Laboratory Apparatus Safety and Anti-Corrosion Products

FREE-END HOSE COUPLING

A NEW hose coupling for use with low and medium pressure compressed air and fluids is available from Airtech Ltd., Haddenham, Bucks. This free-end coupling forms a one-piece unit which need never be dismantled. No preparation of the end of the hose is required and tools are not required for fitting or removing the hose.

For a given inside diameter of hose a given coupling can accept varying wall thicknesses. The hose can be entered or removed as often as required and the average time for effecting a joint is said to be ten seconds.

Two types of couplings manufactured in nylon and suitable for working pressures up to 250 p.s.i. are available. Type D is for joining two lengths of rubber or plastics hose together. The free end of a piece of hose is inserted into each end of the coupling; the body portion of the coupling is then screwed up by hand until the two hoses are securely locked. In this process the hose is progressively gripped by an internal helical steel spring which is reduced in diameter in a conical section of the body.



Hose coupling by Airtech

In type S, one end of this coupling is threaded for attachment to a tool, or to a supply point where the coupling can remain permanently. The other end accepts the free end of the hose.

Similar couplings will shortly be available in brass.

CLEANER FOR LIQUIDS AND DUST

A NEW industrial vacuum cleaner which will pick up liquids as well as dust and dirt, has been introduced by the electrical equipment division of Martindale Electric Co. Ltd., Westmorland Road, London NW9. Known as the Martinet wet-dry suction pick-up, the new cleaner consists of any standard Martindale portable blower mounted on a rust-proof four-gallon tank, on wheels, with filter bag, hose and suction tool attachments. The lid of the tank is made of cast aluminium and incorporates a centrifugal device which ensures that while liquids and heavy dust particles are sucked into the tank, only fine dust is passed through to a filter bag attached to the blower unit. A shut-off device operates when four gallons of liquid have been picked up and closes the suction inlet. The lid is clamped to the tank with quick-release toggle clips.

The Martinet can be used for picking up soapy water, detergents, grease and oils off any type of flooring, and a 12-inch squeegee floor tool, and a special hose are available for this purpose. For collecting dust any Martindale suction tool can be fitted on to the standard 6 ft. rigid tube, which is attached by the hose to the wet-dry cleaner. As a dry-cleaner the Martinet can also be used for vacuuming dirt from walls, ceilings, plant, etc.

The model can be pulled along easily by means of a handle on the blower unit.

OIL-TIGHT CONTROL UNITS

A NEW range of heavy duty oil-tight control units is being produced by Igranic Electric Co. Ltd., Bedford. Of compact design, the range includes control units in the form of push buttons, indicating lights, selector switches and Roto-push buttons.

Each contact block contains two separate circuits, mechanically and electrically isolated, and can be obtained with both circuits normally open, both normally closed, or one normally open and one normally closed. The block is moulded in phenolic material with terminals permanently staked. For oil tightness, there is a neoprene diaphragm seal behind each button. Six oil drainage vents prevent oil accumulation, while tight-seating gaskets provide an oil seal between operator and panel.

FLAME-PROOF CHART UNIT

TO MEET demands for flame-proof equipment, Walker, Crosweller and Co. Ltd., Cheltenham, have now developed an electrically driven flame-proof chart unit for their range of Arkon pressure and vacuum, gas flow and effluent flow recorders.

The driving motor is contained in a flame-proof housing mounted on top of the recorder case and driven by a vertical shaft at 3 r.p.m. This shaft is fitted with an eccentric which causes a spring-loaded lever to oscillate. The lever is fitted with a pawl which, on the forward stroke, causes a ratchet wheel to advance one tooth. From the ratchet wheel a train of gears conveys the drive to the final shaft which carries a clutch drum for engaging the chart drive roller.

Where flow recorders are fitted with an integrator a pair of bevel wheels on the vertical shaft takes off the drive to the integrator.

NEW PRISM FOR UVISPEK

A NEW prism has been designed for the Uvispek spectrophotometer made by Hilger and Watts Ltd., 98 St. Pancras Way, Camden Road, London NW1. Made of synthetic fused silica, which is said to be more transparent than quartz at wavelengths below about 2,500 Å, it is claimed to give a much better ratio between transmitted light and stray light at short wavelengths. The effect of stray light at 2,000 Å and below is reduced to negligible proportions.

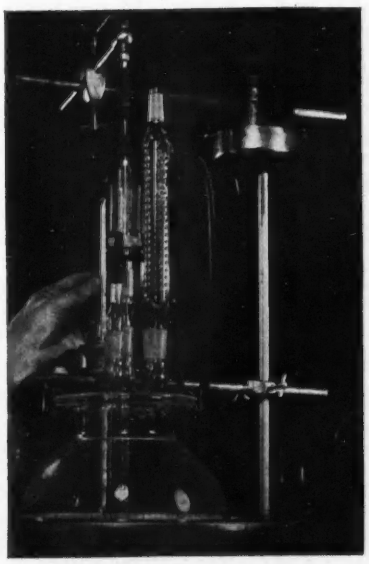
The range of the Uvispek is extended down to 1,850 Å by this prism. It can be used with all but the very earliest models of the instrument, *i.e.* with series numbers below 303.

OPEN-NECK REACTION VESSELS

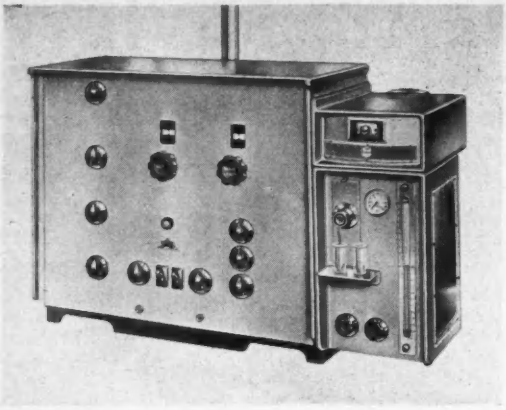
A NEW range of open-neck reaction vessels is described in supplement 4 to the catalogue of Quickfit and Quartz Ltd., Stone, Staffs. Included in the range are flasks and lids with flat-flange connections and an improved stirrer design. The flask can always be detached from its lid, even when a reaction has been conducted at a high temperature with resinous material, or under other conditions when larger conical glass joints tend to 'seize'.

Larger stirrer blades can be accommodated and the reaction vessel can easily be cleaned. All flasks and lids are fully interchangeable.

The flasks, which are now fitted with 100 mm. flat flange joints, range from



Quickfit flat-flange reaction vessel



Flame spectrophotometer by Unicam for research and routine determinations

700 ml. to 20 litres; the cylindrical 700 ml. flask fits a 500 ml. heater. The new range includes four adaptor lids; each lid carrying side necks has a central socket for a stirrer assembly, a socket at 10° to the vertical which will take a cylindrical dropping funnel up to 750 ml. capacity, and a parallel side neck to take a thermometer pocket; other necks will accommodate condenser, stillhead, gas inlet, sample devices, stoppers, etc.

Quickfit open-neck reaction vessels include reflux reaction and distillation units; reflux reaction units and a 20-litre distillation unit.

FLAME SPECTROPHOTOMETER

THE UNICAM SP.900 flame spectrophotometer, a powerful new tool for the analytical chemist, has been introduced by Unicam Instruments Ltd., Arbury Works, Cambridge, at a list price of £850. In addition to its uses in the research laboratory, this model is said to make possible the application of flame photometry to a wide range of routine determinations with great savings of time and material. The sensitivity and resolution of the SP.900 are claimed to bring the following advantages: detection and estimation of trace quantities of elements difficult to determine by other methods; elimination of interference from other excited elements present in the sample; accurate results on very small volumes.

All parts coming into contact with the sample are of glass, p.v.c. or stainless steel. Solutions are fed to the atomiser through a p.v.c. capillary from sample containers placed on a shelf on the front panel.

Alnor dew-point meter

The concentric jet atomiser consists of a glass capillary mounted in a Perspex cylinder. Access to the atomiser, which can be cleared of minor blockage by light finger pressure, is on a thumbscrew. If the capillary becomes seriously contaminated the atomiser can be quickly replaced.

The finely divided fog is fed to an expansion chamber, in which spinning is induced to separate large droplets. Only a fine homogeneous fog reaches the burner. Propane or acetylene is normally recommended, depending on the flame temperature, but hydrogen or other gas may be used with appropriate burners.

Pressure gauges and regulators for gas and air are sited in the atomiser compartment. The burner is of the Meker type; ignition is automatic.

Light from the burner at the rear passes into a monochromator of high light-gathering power and based on the Czerny compensated spherical mirror design. A 60° fused silica prism 70 mm. high and 65 mm. square face is used, which, in conjunction with an appropriate photomultiplier and red sensitive photocell, is suitable for measurements from 250 mμ to 1020 mμ. Results with this model are said to be exceptionally reproducible. The robust galvanometer has a linear scale calibrated 0-100.

In production tests the SP.900 has been found well suited to the simultaneous detection and estimation of calcium, barium, lithium, iron, copper, manganese, magnesium, sodium and potassium etc. Great time-saving over classical methods has been found with serum calcium determinations and the estimation of calcium in the presence of strontium, sodium in the presence of lithium, etc.

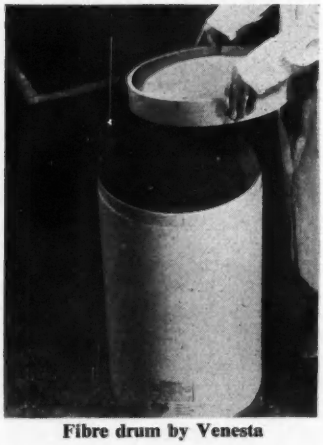
ALNOR DEW-POINT METER

A PRECISION instrument for the measurement of water vapour density and water vapour pressure, proportion of water vapour by volume and dew-points, is now being manufactured under contract in this country by C. F. Casella and Co. Distributors are Electric Resistance Furnace Co. Ltd., Netherby, Queen's Road, Weybridge, Surrey. Called the Alnor dew-point meter, it is a portable, self-contained instrument, manually operated and designed for the measurement of the water vapour content of air or any other gas which has a dew-point within range –80° F to room temperature. It was developed originally by Illinois Testing Laboratories, Chicago, for testing gases that are relatively dry and therefore within the dew-point range where most other methods of measurement become difficult or impossible.

The apparatus operates on the well-known principle that if a gas is compressed and the pressure released, the consequent adiabatic expansion results in a cooling effect. By means of a built-in hand pump, a sample of the gas is drawn into the instrument and held in the observation chamber above atmospheric pressure. The temperature of the gas is then read and the pressure quickly released by depressing the operating valve. This also switches the lamp on, illuminating the chamber, and if the gas has cooled to dew-point due to its rapid expansion, a fog will be observed through the window. Even where there are 'no dust' conditions the radium foil incorporated produces ions to act as substitute nuclei around which the droplets can form. The actual dew-point temperature is read from the slide-rule calculator which gives the relationship between initial temperature, pressure ratio and dew-point for the various Q values.

NEW RANGE OF FIBRE DRUMS

A NEW RANGE of fibre drums claimed to offer industry the opportunity of making savings in packaging costs is announced by Venesta Ltd., Vintry House, Queen Street Place, London EC4. Known as Vendrums, the range includes containers for both home and export trades.



Fibre drum by Venesta

Types 107, 108 and 111 have plywood lids and bases and can be supplied in a range of diameters from 10 in. to 16 in. The length of the drums can be varied to provide a range of contents weights from 56 lb. to 1½ cwt.

Model 107 has a pill-box type lid which fits closely over the body of the drum; it is secured by sealing tape.

In Vendrum 108 the fibre walls at either end of the drum are slightly cut away on the inside to provide a seating on which the plywood ends rest. Model 111 is similar to the 108 but the lid rests

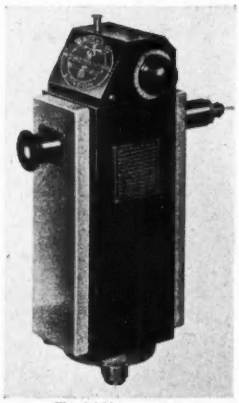
on a riveted lining hoop. It is fastened by a closing hoop.

Two of these containers have a smooth interior so that bag liners may be used without damage. Venesta use their aluminium foil for the moisture proofing of the drums. The foil can be wound on the inside or outside or used as an integral part of the body wall.

PATERSON TURBIDITY METER

THE NEW Paterson turbidity meter has been developed by the Paterson Engineering Co. Ltd., Windsor House, Kingsway, London WC2, for use when determinations have to be made in respect of filtered waters requiring readings in fractions of one unit of turbidity. Rapid and accurate readings are obtainable with the meter, an optical instrument which is of simple construction and is permanently ready for use as it requires no adjustment or preparation of standard solutions.

The instrument consists of a vertical ebonite body, of one litre capacity, on



Turbidity meter

the back and front faces of which are mounted two mirrors facing each other at a slight angle and protected by aluminium back plates. Each mirror has an aperture, one of these permitting the passage of a ray of light from a lamp of standard strength and the other allowing the opposite mirror to be viewed.

To operate the instrument the ebonite head is removed and a sample of liquid is poured in until the mirrors are completely covered. The head is then replaced and when the electric light is switched on multiple reflections of the light spot are observed in the form of a row of light spots on the mirror face opposite the viewing aperture. The number of spots visible indicates the turbidity of the liquid and to obtain a reading a slider, actuated by an ebonite knob on the right hand side of the head, is moved until it touches but does not obscure, the last visible light spot. An arrow on the indicating knob gives a direct reading in units of turbidity on a circular scale.

A vertical regulating rod enables the operator to use the slider as a stirrer, independently of the control knob, to prevent inaccuracy due to the settlement of the suspended content. The meter is suitable for direct readings of turbidity up to about 8 units. Determinations on more turbid liquids are obtained by dilution of the sample. Its accuracy is such that readings as low as 0.2 units can be obtained.

PLASTICS SAFETY GOGGLE

A NEW multi-purpose plastics safety goggle is now being offered by Safety Products Ltd., Holmethorpe Avenue, Redhill, Surrey. The moulded edges of the p.v.c. frame are said to harmonise with the contours of the face, fit snugly across the bridge of the nose and exclude dust, flying particles and splashes.

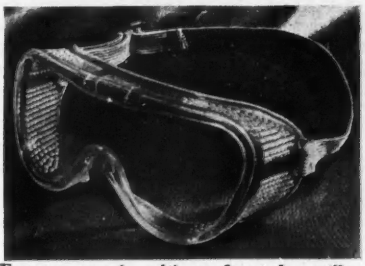
The lens of .060 in. non-inflammable clear acetate is proof against shattering under all reasonable working conditions and cannot be dislodged. Lenses of .040 in. acetate are available for lighter duty. The goggle is claimed to be resistant to abrasion and to acids and alkalis.

Ventilation is provided by perforations on the frame or by baffle port ventilators fitted with gauze screens to prevent dust entry. Goggles can be supplied without ventilation and replacement lenses can be quickly fitted. Replaceable elastic headbands have quick-release buckles. The goggle will not discolour when sterilised.

PRECISION VACUUM OVEN

ABOUT to go into production with the Gardiner precision vacuum oven, a unique design developed in the research laboratories of Tate and Lyle during an investigation of the difficulties of drying such labile products as sugar syrups and molasses containing fructose, are Griffin and George Ltd., Ealing Road, Alperton, Wembley. Wide use of the oven is now envisaged wherever precise and reproducible results are needed in determinations of loss of weight on heating.

An air bleed drying train, consisting of three 6 by $\frac{3}{4}$ in. glass U-tubes, to be filled with activated alumina, assembled on the inner face of the door, and a glass tube, 9 in. by 2 in. diameter to be filled with barium oxide and positioned horizontally in the case reduces the water content of the air supplied to the test chamber to 0.0007 mg/l.



Eyecare goggle with perforated ventilation in the frame

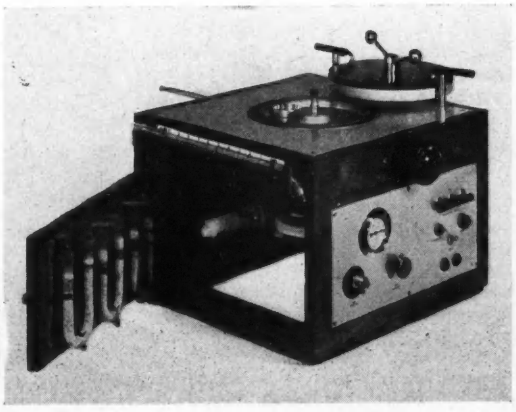
Mounted on the control panel, on one side of the case, are air and vacuum control valves, vacuum gauge, electrical control switches, fuses, mains and thermostat indicating lights. A bimetallic thermostat, adjustable to 100° ± 1°C, thermometer 0-110°C by 1°C, soap film flowmeter, 0-100 ml./min. with guard, and vacuum pump connector are also fitted. A cadmium-plated mild steel 'heating block', 9 in. in diameter by $1\frac{1}{4}$ in. thick, is mounted in the case. It is heated by 12 refractory heating elements, inserted radially and penetrating to near the centre. A metal desiccator, $4\frac{1}{8}$ in. in diameter by 4 in. deep, has a removable base-plate and houses a glass P_2O_5 dish, 100 mm. in diameter by 52 mm. deep.

Air flow to the chamber can be controlled and measured between 0.5 and 100 ml./min. by a soap film flowmeter.

CAPACITANCE LEVEL CONTROLLER

LATEST addition to the range of level controllers by Fielden Electronics Ltd., Wythenshawe, Manchester, is the Tektor Major. Features incorporated in the Major include calibrated set control, and a quick release chassis. Sensitivity is claimed to be better than 1.0 pF under all conditions and negligible effects are said to result from a change of 10 per cent in supply voltage or an ambient temperature change from—20 to 50°C. A new range of electrodes has also been designed parallel with the development of the Major.

For the high level model the maximum cable length has been extended to 35 ft. and for the low level model 20 ft. Fail-to-safe facilities have been provided.



Prototype of the Gardiner oven. In the production model the top plate is solid with the observation windows omitted

PEOPLE in the news

● Additional members of the council of the Pharmaceutical Society of Great Britain for the next four years re-appointed by the Privy Council are: DR. B. A. YOUNG, St. Alfege's Hospital, SE10; PROFESSOR A. D. MACDONALD, University of Manchester; and DR. WILLIAM LANE-PETTER, director of the Laboratory Animals' Bureau of the Medical Research Council.

● MR. J. C. ROUSSEL, chairman of the Roussel group, accompanied by MR. J. MACHIZAUD and DR. A. GREMEAUX will fly from London and Paris in February to inaugurate the new Australian offices of Roussel Pharmaceuticals (Pty.) Ltd. in Caltex House, Sydney. The Roussel group in London already has strong ties with Australia, for their entire production of cortisone and allied chemicals is made from Australian ox-bile. The material is shipped for synthesis to the modern cortisone plant at Stratford, London E.

● DR. VANNEVAR BUSH, has been elected chairman of the board of directors of Merck and Co. Inc., New Jersey, US, parent organisation of Merck Sharp and Dohme International, manufacturing chemists.

Dr. V. Bush

During the war Dr. Bush was a leading figure in nuclear fission development as well as in the mobilisation of the US scientific effort, including medical research. For many years he was president of the Carnegie Institution of Washington, and he also holds the post of chairman of the Corporation of Massachusetts Institute of Technology. Dr. Bush has been a director of the company since 1949 and as chairman of the board he succeeds GEORGE W. MERCK, who died in November 1957.

● MR. F. R. GRAESSER-THOMAS, founder of Graesser Salicylates Ltd., Chester, has been presented with a silver salver by the directors and staff to mark the company's jubilee.

● New chairman of the Anglo-French Phosphate Co. is MR. F. J. PEDLER. He has taken over from MR. R. H. MUIR, who has resigned from the board.

● MR. W. L. HEYWOOD has resigned from the council for Scientific and Industrial Research on his taking up an appointment as a member of the Restrictive Practices Court. The Lord President of the Council has appointed as his successor MR. LEWIS T. WRIGHT, general secretary of the Amalgamated Weavers' Association. Mr. Wright is chairman of both the production and scientific advisory committees of the Trades Union Congress and is also chairman of the British Productivity Council.

● New chairman of Gas Purification and Chemical Co. is MR. D. D. MATHIESON. He succeeds MR. J. R. SORSBIE who has resigned from the board owing to ill-health. MR. L. L. ROSSITER continues as deputy chairman.

● MR. M. W. WALTON, who has been appointed assistant sales manager of the chemicals division trade sales department, Newton Chambers and Co. Ltd., Thorncliffe, Sheffield, as part of the division's expansion programme, joined the company in 1955 as a trade sales representative. Aged 28, he will be concerned with the department's three sales districts in London, the east and the south. He has taken over these areas from MR. L. V. FISHER, who continues as assistant sales manager, dealing with four northern sales districts.

● The elections are announced of MR. DERRICK KLEEMANN, as chairman of Erinoid, and MR. ERNEST OSBORNE as a director. Mr. Kleemann is chairman of O. and M. Kleemann which recently acquired a controlling interest in Erinoid.

MR. C. E. CLEEVE, MR. H. E. HARDEN and MR. W. R. MERTON have resigned from the board of Erinoid.

● MR. J. MATHIE has retired from his directorship of O. and M. Kleemann.

● MR. W. C. EASTERBROOK, who has been in charge of the ICI Nobel division's analytical and standardisation laboratories for many years has retired. He was guest at a farewell meeting when DR. D. TRAILL, research director, said that Mr. Easterbrook had been responsible for the operation of the division's method of standardisation which had been adopted throughout the company.

● The vacancy created by the retirement of DR. EDMUND C. HANDER, as senior geologist of Aluminium Ltd., has now been filled by the election of MR. C. D. HOWE, previously consulting engineer and former Minister of Trade and Commerce in Canada, to the board of the company. Mr. Howe is a member of the boards of several companies, including those of the Rio Tinto Mining Co. of Canada and Dominion Tar and Chemical Co.

● MR. R. Y. PARRY, who has been appointed technical manager of Isotope Developments Ltd., Beenham Grange, Aldermaston Wharf, near Reading, gained his previous experience in nucleonics with E. K. Cole Ltd. He was chairman of the nucleonics group, Scientific Instrument Manufacturers' Association, from 1955 to 1957 and was a member of SIMA council during this period. He is a member of the BSI committee on glossary of terms used in nuclear science. MR. J. S. EPPSTEIN has been appointed chief engineer of Isotope Developments. He had been head of the electronics division since joining the company in 1951, and in this capacity was responsible for the electronic design of nuclear instrumentation for reactors, industrial equipment such as thickness, level and density gauges, and laboratory instruments for tracer experiments, medical uses of radioisotopes, etc. Before joining ID he spent four years in the nuclear physics division at AERE, Harwell.

R. W. Parry

J. S. Eppstein

UK May Take US Atom Fuel

US report, as yet unconfirmed by the UK Embassy and the US Atomic Energy Commission in Washington, states that the UK has requested the US to supply uranium fuel for use in future atomic power plants. According to this report no final decision has been reached, but as part of a broader agreement for closer atomic co-operation between the UK and US, the UK request would be fulfilled.

The UK AEA, when approached by CHEMICAL AGE, stated 'No comment.'

Obituary

SIR ALEXANDER GIBB died at his home on 21 January. Sir Alexander, who was knighted in 1920, was a consulting engineer and was a member of many institutions, including the Institution of Chemical Engineers.

The death was announced on 20 January of DR. DAVID CHAPMAN, at Oxford, aged 88. Formerly vice-principal, Jesus College, Oxford, he made a life-long study of chemical kinetics. He was elected a Fellow of the Royal Society in 1912. Dr. Chapman was in charge of the Sir Leoline laboratories, Oxford.

Commercial News

Borax (Holdings) Profits Higher and Dividend Up

EXPANSION of group trading profits of Borax (Holdings) from £3,190,115 to £3,999,495 is announced for the year to September 1957. The group dividend on the £9 million deferred ordinary capital is raised from the equivalent of 8¼ per cent to 8¾ per cent. The final dividend is 3.50d per 5s unit, making a total of 5.25d, against the equivalent of 5d per unit.

Trading balance in 1956-57 was £2,999,135, compared with £2,643,464, after charging £1,000,360, against £546,651 for depreciation, depletion and amortisation. The net profit, after taxation other than profits-tax on distribution, is increased from £2,091,478 to £2,115,461.

O. and M. Kleemann

O. and M. Kleemann announce that as a result of reorganisation, all the manufacturing and selling activities of the company will be conducted under the name of the new wholly owned subsidiary, Kleemann Plastics. Directors of the new subsidiary will be: Mr. D. Kleemann, chairman, Mr. J. Kleemann, deputy chairman, Mr. H. Kleemann, managing director, and Mr. L. Kuepler.

British Benzol

Reviewing the financial year to 31 October 1957, of British Benzol and Coal Distillation Ltd., the chairman, Mr. G. H. Johnson, said that production costs continued their upward trend, outstripping the combined benefits of permitted increased prices, higher production and technical economies. After providing for depreciation and taxation, the net profit fell by £12,000, compared with the previous year.

The directors recommended a final dividend of 10 per cent, making a total of 15 per cent, less income tax for the year.

US Borax and Chemical

Results published in the US by US Borax and Chemical, the main operating subsidiary of Borax (Holdings), which owns 74½ per cent of the US company, show that net sales for the year to 30 September, 1957, are slightly up at $150,987,907 (£50,493,900) but net income is slightly down at $5,470,931 compared with the previous year's $6,778,080 ($1.15 against $1.47 per common share).

Four reasons are suggested for the fall in net income: higher production costs for both borax and potash products, without compensating price increases for borax, and an actual reduction in both price and volume for potash; heavy initial expenses late in the year in starting up the new $20-million opencast mining and refinery project at Boron, California; heavier research and development costs ($849,000 as against $490,000), which are expected to reach $1.5 million next year; and heavier interest charges.

It is reported that there were delays in construction of the new plant at Boron and that the running-in process took longer than expected. Outlook for boron products in the present year is considered to be satisfactory, but owing to increasing costs and competition and lower prices, the company believe that it is likely that potash earnings will decline further in the current year. However, basic potash demand is stated to show an upward trend, so that it is thought that long-term prospects are still promising.

Royal Dutch Petroleum

Details of the subscription procedure for the Royal Dutch Petroleum's offer of 7,602,285 shares of Fls. 20 on a 1-for-8 basis at Fls. 114, or US $30 per share have now been issued. Rights can be exercised by the surrender of dividend coupons No. 114 for five and 50 shares, or by surrender of dividend coupons Series A, which are being issued to registered holders of shares registered in UK section of the Amsterdam register.

The directors intend to fix the total dividend at Fls. 5 per share for 1957, the same amount as for 1956. This makes the final dividend Fls. 3.50 per share to be payable on the increased capital.

The Royal Dutch - Shell group announcement of the issue states that total capital expenditure and exploration costs for 1957 are estimated to have amounted to approximately £400 million, and there are indications that the same amount would have to be spent in 1958.

INCREASE OF CAPITAL

PFIZER LTD. Chemical, medical and pharmaceutical manufacturers, 137-9 Sandgate Road, Folkestone. Increased by £750,000 in £1 ordinary shares, beyond the registered capital of £1,250,000.

FOR YOUR DIARY

MONDAY 27 JANUARY

CS—Durham: West Building, The Science Laboratories, The University. 5.15 p.m. 'Reduction by metal-ammonia solutions' by Prof. A. J. Birch.

TUESDAY 28 JANUARY

CS—Dundee: Chemistry Dept., Queen's College. 5.15 p.m. 'Hydrocarbon complexes of the transition metals' by Prof. G. Wilkinson.

CS, RIC & SCI—Edinburgh: Biochemistry Lecture Theatre, Teviot Place. 7.30 p.m. 'Recent developments in polymer science' by Prof. G. Gee.

Parliamentary and Scientific Committee—London: Committee Room 12, House of Commons. 5.15 p.m. Meeting of general committee.

THURSDAY 30 JANUARY

CS—Liverpool: Chemistry Lecture Theatre, The University. 5 p.m. 'The synthesis of natural products employing acetylenic compounds' by Prof. R. A. Raphael.

I Chem E—Loughborough: College of Technology. 7.30 p.m. 'The chemical processing of nuclear fuels' by B. F. Warner.

FRIDAY 31 JANUARY

CS—Birmingham: Chemistry Dept., The University. 4.30 p.m. 'The chemistry of the tannins' by Prof. R. D. Haworth.

CS—Newcastle upon Tyne: Chemistry Dept., King's College. 5.30 p.m. 'The structure of flames' by Dr. J. W. Linnett.

CS & RIC—Southampton: Chemistry Dept., The University. 5 p.m. 'Chemical significance of band intensities' by Dr. H. W. Thompson.

I Chem E—Manchester: Midland Hotel. 3.30 p.m. Annual general meeting of North-western branch.

Incorporated Plant Engineers—Birmingham: Imperial Hotel, Temple Street. 7.30 p.m. 'Trade effluent treatment' by J. Lakin.

RIC—Brighton: Technical College. 6.30 p.m. 'Some chemical aspects of packaging' by F. A. Paine.

SATURDAY 1 FEBRUARY

I Chem E—Birmingham: Midlands Institute, Paradise Street. 2.30 p.m. Annual general meeting of Midlands branch followed by 'The choice of materials for sugar refining plant' by H. M. Peacock.

Market Reports

HESITANCY IN FORWARD BUSINESS

LONDON Whilst the overall demand for industrial chemicals remains steady with a good intake against contracts, there has been some hesitancy in placing new home business beyond immediate requirements. On the other hand, the volume of export enquiry shows no sign of diminishing.

With few exceptions prices continue firm in most sections of the market. The current price of copper sulphate is lower at £67 per ton less 2 per cent f.o.b. Liverpool. As previously noted the prices of borax and boric acid are to be increased as from 17 February.

MANCHESTER Apart from the non-ferrous metals compounds, which are still uncertain in tendency, quotations for heavy chemical products on the Manchester market during the past week have mostly been on a firm basis. On the whole, contracts for textile and other industrial chemicals are being drawn against fairly well, and fresh enquiries are circulating from home users as well as from shippers. The demand for fertiliser materials is on an improving scale and a steady increase in the movement of most descriptions is looked for. The call for the light and heavy tar products has been fairly well maintained.

GLASGOW The past week has shown an improvement in the Scottish heavy chemical market, and a much brisker position has prevailed. Demands were of a varied nature, and covered quite a wide range of chemicals, together with a cross section of industry. Prices showed little or no change and remained fairly firm. Considerable activity has also been shown in the export market, with quite a volume of enquiries being received. The agricultural market, although still rather quiet, did show some improvement, particularly in regard to forward bookings.

BRITISH CHEMICAL PRICES

GENERAL CHEMICALS

Acetic Acid. D/d in ret. barrels (tech. acid barrels free); in glass carboys, £8; demijohns, £12 extra. 80% tech., 10 tons, £97; 80% pure, 10 tons, £103; commercial glacial, 10 tons, £106.

Acetic Anhydride. Ton lots d/d, £136.

Alum, Ground, f.o.r., about £25.
MANCHESTER: Ground, £25.

Aluminium Sulphate. Ex-works, d/d, £15 10s to £18.
MANCHESTER: £16 to £18 10s.

Ammonia, Anhydrous. Per lb., 1s 9d,-2s 3d.

Ammonium Chloride. Per ton lot, in non-ret. pack, £27 to £30 2s 6d.

Ammonium Nitrate. D/d, 4-ton lots, £31.

Ammonium Persulphate. Per cwt., in 1-cwt. lots, d/d, £6 13s 6d; per ton, in min. 1-ton lots, d/d, £123 10s.

Ammonium Phosphate. Mono-and di-, ton lots, d/d, £106 and £97 10s.

Antimony Sulphide. Per lb., d/d UK in min. 1-ton lots: crimson, 4s 7d to 5s 0½d; golden, 2s 10½d to 4s 3½d.

Arsenic. Ex-store, £45 to £50.

Barium Carbonate. Precip., d/d, 4-ton lots, bag packing, £41.

Barium Chloride. 2-ton lots, £49.

Barium Sulphate [Dry Blanc Fixe]. Precip. 2-ton lots, d/d, £43.

Bleaching Powder. Ret. casks, c.p. station, in 4-ton lots. £30 7s 6d.

* **Borax.** Ton lots, in hessian sacks, c.p. Tech., anhydrous, £66; gran., £45; crystal, £47 10s; powder, £48 10s; extra fine powder, £49 10s; BP, gran., £51; crystal, £56 10s; powder, £57 10s; extra fine powder, £58 10s. Most grades in 6-ply paper bag, £1 less.

* **Boric Acid.** Ton lots, in hessian sacks, c.p. Tech., gran., £74 10s; crystal, £82 10s; powder, £80; extra fine powder, £82; BP gran., £87 10s; crystal, £94 10s; powder, £92; extra fine powder, £94. Most grades in 6-ply paper bag, £1 less.

Calcium Chloride. Ton lots, in non-ret. pack: solid and flake, about £15.

Chlorine, Liquid. In ret. 16-17-cwt. drums d/d in 3-drum lots, £40.

Chromic Acid. Less 2½%, d/d UK, in 1-ton lots, per lb., 2s 2¾d.

Chromium Sulphate, Basic. Crystals, d/d, per lb., 8½d; per ton, £79 6s 8d.

Citric Acid. 1-cwt. lots, per cwt., £11 5s.

Cobalt Oxide. Black, per lb., d/d, bulk quantities, 13s 2d.

Copper Carbonate. Per lb., 3s 3d.

Copper Sulphate. F.o.b., less 2% in 2-cwt. bags, £67.

Cream of Tartar. 100%, per cwt., about £11 12s.

Formaldehyde. In casks, d/d, £39 10s.

Formic Acid. 85%, in 4-ton lots, c.p., £89.

Glycerine. Chem. pure, double distilled 1,260 s.g., per cwt., in 5-cwt. drums for annual purchases of over 5-ton lots and under 25 tons, £10 1s 6d. Refined pale straw industrial, 5s per cwt. less than chem. pure.

Hydrochloric Acid. Spot, per carboy, d/d (according to purity, strength and locality), about 12s.

Hydrofluoric Acid. 60%, per lb., about 2s 6d per lb.

Hydrogen Peroxide. Carboys extra and ret. 27.5% wt., £128 10s; 35% wt., d/d, £158.

Iodine. Resublimed BP, under 1 cwt., per lb., 14s 4d; for 1-cwt. lots, per lb., 13s 5d.

* For price changes from 17 February see Chemical Age 11 January (p. 134), 18 January (p. 175)

These prices are checked with the manufacturers, but in many cases there are variations according to quality, quantity, place of delivery, etc.

Abbreviations: d/d, delivered; c.p., carriage paid; ret., returnable; non-ret. pack., non-returnable packaging; tech., technical; comm., commercial; gran., granular.

All prices per ton unless otherwise stated

Iodoform. Under 1 cwt., per lb., £1 2s 11d, for 1-cwt. lots, per lb., £1 2s 3d.

Lactic Acid. Pale tech., 44% by wt., per lb., 14d; dark tech., 44% by wt., per lb., 9d; chem. quality, 44% by wt., per lb., 12½d; 1-ton lots, ex-works, usual container terms.

Lead Acetate. White, about £154.

Lead Nitrate. 1-ton lots, about £135.

Lead, Red. Basis prices: Genuine dry red, £104 5s; orange lead, £116 5s. Ground in oil: red, £125 5s, orange, £137 5s.

Lead, White. Basis prices: Dry English in 5-cwt. casks, £115 15s; Ground in oil: English, 1-cwt. lots, per cwt., 194s.

Lime Acetate. Brown, ton lots, d/d, £40; grey, 80-82%, ton lots, d/d, £45.

Litharge. In 5-ton lots, £106 5s.

Magnesite. Calcined, in bags, ex-works, about £21.

Magnesium Carbonate. Light, comm., d/d, 2-ton lots, £84 10s under 2 tons, £97.

Magnesium Chloride. Solid (ex-wharf), £17 10s.

Magnesium Oxide. Light, comm., d/d, under 1-ton lots, £245.

Magnesium Sulphate. Crystals, £16.

Mercuric Chloride. Tech. powder, per lb., for 5-cwt. lots, in 28-lb. parcels, £1 0s 6d; smaller quantities dearer.

Mercury Sulphide, Red. 5-cwt. lots in 28-lb. parcels, per lb., £1 9s 3d.

Nickel Sulphate. D/d, buyers UK, nominal, £170.

Nitric Acid. 80° Tw., £35.

Oxalic Acid. Home manufacture, min. 4-ton lots, in 5-cwt. casks, c.p., about £129.

Phosphoric Acid. Tech. (s.g. 1.700) ton lots, c.p., £100; BP (s.g. 1.750), ton lots, c.p., per lb. 1s 4d.

Potash, Caustic. Solid, 1-ton lots, £95 10s; liquid, £36 15s.

Potassium Carbonate. Calcined, 96/98%, 1-ton lots, ex-store, about £74 10s.

Potassium Chloride. Industrial, 96%, 1-ton lots, about £24.

Potassium Dichromate. Crystals and gran., per lb., in 5-cwt. to 1-ton lots, d/d UK, 1s 2½d.

Potassium Iodide. BP, under 1-cwt., per lb., 9s; per lb. for 1-cwt. lots, 8s 6d.

Potassium Nitrate. 4-ton lots, in non-ret. pack, c.p., £63 10s.

Potassium Permanganate. BP, 1-cwt. lots, per lb., 1s 11½d; 3-cwt. lots, per lb., 1s 10¾d; 5-cwt. lots, per lb., 1s 10½d; 1-ton lots, per lb., 1s 10d; 5-ton lots, per lb., 1s 9½d. Tech., 5-cwt. in 1-cwt. drums, per cwt., £9 15s 6d; 1-cwt. lots, £10 4s 6d.

Salammoniac. Ton lot, in non-ret. pack, £47 10s.

Salicylic Acid. MANCHESTER: Tech., d/d, per lb., 2s 4d., 1-ton lots.

Soda Ash. 58% ex-depot or d/d, London station, 1-ton lots, about £17 3s.

Soda, Caustic. Solid 76/77%: spot, d/d 1-ton lots, £33 16s 6d.

Sodium Acetate. Comm. crystals, d/d, £91.

Sodium Bicarbonate. Ton lot, in non-ret. pack., £16 10s.

Sodium Bisulphite. Powder, 60/62%, d/d, 2-ton lots for home trade, £46 2s 6d.

Sodium Carbonate Monohydrate. Ton lot, in non ret. pack, c.p., £57.

Sodium Chlorate. 1-cwt. drums, c.p. station, in 4-ton lots, about £88 10s.

Sodium Cyanide. 96/98%, ton lot in 1-cwt. drums, £113 5s.

Sodium Dichromate. Crystals, cake and powder, per lb., 1s. Net d/d UK, anhydrous, per lb., 1s 1¾d. Net. del. d/d UK, 5-cwt. to 1-ton lots.

Sodium Fluoride. D/d, 1-ton lots and over, per cwt., £5; 1-cwt. lots, per cwt., £5 10s.

Sodium Hyposulphite. Pea crystals, £3[illegible]; comm., 1-ton lots, c.p., £34 15s.

Sodium Iodide. BP, under 1 cwt., per lb., 14s 1d; 1-cwt. lots, per lb., 13s 2d.

Sodium Metaphosphate [Calgon]. Flake, paper sacks, £133.

Sodium Metasilicate. D/d UK in 1 ton lots, 1 cwt. free paper bags, £27 10s.

Sodium Nitrate. Chilean refined gran. over 98%, 6-ton lots, d/d c.p., £29 10s.

Sodium Nitrite. 4-ton lots, £32.

Sodium Perborate. (10%0) in 1-cwt. free kegs, ton lots, £145 15s.

Sodium Percarbonate. 12½% available oxygen, per cwt., in 1-cwt. kegs, £8 10s 9d.

Sodium Phosphate. D/d, ton lots: di-sodium, crystalline, £40 10s, anhydrous, £88; tri-sodium, crystalline, £39 10s, anhydrous, £86.

Sodium Silicate. 75-84° Tw. Lancs and Ches., 4-ton lots, d/d station in loaned drums, £11 17s 6d; Dorset, Somerset and Devon, per ton extra, £3 17s 6d; Scotland and S. Wales, extra, £3. Elsewhere in England, not Cornwall, extra, £1 12s 6d.

Sodium Sulphate [Desiccated Glauber's Salt]. D/d in bags, about £20.

Sodium Sulphate [Glauber's Salt]. D/d, £18 10s to £18 15s.

Sodium Sulphate [Salt Cake]. Unground, d/d station in bulk, £10.
MANCHESTER: d/d station, £10 10s.

Sodium Sulphide. Solid, 60/62%, spot, d/d, in drums in 1-ton lots, £36 2s 6d; broken, d/d, in drums in 1-ton lots, £37 2s 6d.

Sodium Sulphite. Anhydrous, £71 10s; comm., d/d station in bags, £27-£28 10s.

Sulphur. 4 tons or more, ground, according to fineness, £20-£22.

Sulphuric Acid. Net, naked at works, 168° Tw. according to quality, £10 10s.-£12 2s 6d; 140° Tw., arsenic free, £8 15s.; 140°Tw., arsenious, £8 9s 6d.

Tartaric Acid. Per cwt.: 10 cwt. or more, £14; 1 cwt., £14 5s.

Titanium Oxide. Standard grade comm., rutile structure, £178 5s.; standard grade comm., anatase structure, £162 5s.

Zinc Oxide. Max. for 2-ton lots, d/d, white seal, £90 10s; green seal, £88 10s; red seal, £85 10s.

SOLVENTS AND PLASTICISERS

Acetone. All d/d. In 5-gal. drums, £128 in 10-gal. drums, £118; in 40-45-gal. drums, under 1 ton, £93; 1-5 tons, £90; 5-10 tons, £89; 10 tons and up, £88; in 400-gal. tank wagons, £85.

Butyl Acetate BSS. 10-ton lots, £173.

***n*-Butyl Alcohol BSS.** 10 tons, in drums, d/d, £152.

***sec*-Butyl Alcohol.** All d/d. In 5-gal. drums, £168; in 10-gal. drums, £158; in 40-45 gal. drums, under 1 ton, £133; 1-5 tons, £130; 5-10 tons, £129; 10 tons and up, £128; in 400-gal. tank wagons, £125.

tert-**Butyl Alcohol.** 5-gal. drums, £195 10s; 40/45-gal. drums: 1 ton, £175 10s; 1-5 tons, £174 10s; 5-10 tons, £173 10s; 10 tons and up, £172 10s.
Diacetone Alcohol. Small lots: 5-gal. drums, £185; 10-gal. drums, £175. 40/45-gal. drums: under 1 ton, £148; 1-5 tons, £147; 5-10 tons, £146; 10 tons and over, £145, in 400 gal. tank wagons; £142.
Dibutyl Phthalate. In drums, 10 tons, d/d, per ton, £222; 45-gal. drums, d/d, per lb., 2s ½d.
Diethyl Phthalate. In drums, 10 tons, per ton, £187 10s; 45-gal. drums, d/d, per lb., 1s 9d.
Dimethyl Phthalate. In drums, 10 tons, per ton, d/d, £179, 45-gal. drums, d/d, per lb., 1s 8d.
Dioctyl Phthalate. In drums, 10 tons, d/d, per lb., 2s 8d; 45-gal. drums, d/d, per lb., 2s 9½d.
Ether BSS. 1-ton lots, drums extra, per lb., 1s 11d.
Ethyl Acetate. 10-ton lots, d/d, £145.
Ethyl Alcohol [PB 66 o.p.]. Over 300,000 p. gal. 4s 0½d; d/d in tankers, 2,500-10,000 p. gal., per p. gal., 4s 2⅝d. D/d in 40/45-gal. drums, p.p.g. extra, 1d. Absolute alcohol (75.2 o.p.), p.p.g. extra, 5d.
Methanol. Pure synthetic, d/d, £43 15s.
Methylated Spirit. Industrial 66° o.p.: 500-gal. and up, d/d in tankers, per gal., 5s 10½d; 100-499 gal. in drums, d/d, per gal., 6s 3d-6s 5d. Pyridinised 66 o.p. : 500 gal. and up, in tankers, d/d, per gal., 6s 2d; 100-499 gal. in drums, d/d, per gal., 6s 6½d-6s 8½d.
Methyl Ethyl Ketone. All d/d. In 5-gal drums, £183; in 10-gal. drums, £173; in 40-45-gal. drums, under 1 ton, £148; 1-5 tons, £145; 5-10 tons, £144; 10 tons and up, £143; in 400-gal. tank wagons, £140.
Methyl *iso*Butyl Carbinol. All d/d. In 5-gal. drums, £203 ; in 10-gal. drums, £193 ; 40-45 gal. drums, less than 1 ton, £168 ; 1-9 tons, £165 ; 10 tons and over, £163 ; in 400-gal. tank wagons, £160.
Methyl *iso*Butyl Ketone. All d/d. In 5-gal. drums, £209; in 10-gal. drums, £199; in 40-45-gal. drums, under 1 ton, £174; 1-5 tons, £171; 5-10 tons, £170; 10 tons and up, £169; in 400-gal. tank wagons, £166.
***iso*Propyl Acetate.** In drums, 10 tons, d/d, £137; 45-gal. drums, d/d, £143.
***iso*Propyl Alcohol.** Small lots: 5-gal. drums, £118; 10-gal. drums, £108; 40-45 gal. drums: less than 1 ton, £83; 1-9 tons, £81; 10-50 tons, £80 10s; 50 tons and up, £80.

RUBBER CHEMICALS

Carbon Disulphide. According to quality, £61-£67.
Carbon Black. Per lb., according to packing, 8d-1s.
Carbon Tetrachloride. Ton lots, £83 15s.
India-Rubber Substitutes. White, per lb., 1s 8¾d to 2s 0½d; dark, d/d, per lb., 1s 3d-1s 5½d.
Lithopone. 30%, about £59.
Mineral Black. £7 10s-£10.
Sulphur Chloride. British, about £50.
Vegetable Lamp Black. 2-ton lots, £64 8s.
Vermilion. Pale or deep, 7-lb. lots, per lb., 15s 6d.

COAL-TAR PRODUCTS

Benzole. Per gal., min. 200 gal., d/d in bulk, 90's, 5s 3d; pure, 5s 7d.
Carbolic Acid. Crystals, min. price, d/d bulk, per lb., 1s 4d; 40/50-gal. ret. drums extra, per lb., ½d. Crude, 60's, per gal., 8s 4d.
MANCHESTER: Crystals, d/d, per lb., 1s 4d-1s 7d; crude, naked, at works, 8s.
Creosote. Home trade, per gal., according to quality, f.o.r. maker's works, 1s-1s 9d. MANCHESTER: Per gal., 1s 2d-1s 8d.
Cresylic Acid. Pale 99/100%, per gal., 6s 6d; 99.5/100%, per gal., 6s 8d. D/d UK in bulk: Pale ADF, per imperial gallon f.o.b. UK, from 7s 8d to 9s 3d; per US gallon, c.i.f. NY, 100 to 118.5 cents freight equalised.
Naphtha. Solvent, 90/160°, per gal., 5s 3d; heavy, 90/190°, for bulk 1,000-gal. lots, d/d, per gal., 3s 11d. Drums extra; higher prices for smaller lots.
Naphthalene. Crude, 4-ton lots, in buyers' bags, nominal, according to m.p.: £19-£30; hot pressed, bulk, ex-works, £40; refined crystals, d/d min. 4-ton lots, £65-£66.
Pitch. Medium, soft, home trade, f.o.r. suppliers' works, £10 10s; export trade, f.o.b. suppliers' port, about £12.
Pyridine. 90/160, per gal., 15s.-17s 6d.
Toluole. Pure, per gal., 5s 9d; 90's, d/d, 2,000 gal. in bulk, per gal., 5s. MANCHESTER: Pure, naked, per gal., 5s 6d.
Xylole. According to grade, in 1,000-gal. lots, d/d London area in bulk, per gal., 6s 2d-6s 6d.

INTERMEDIATES AND DYES

(Prices Nominal)

m-**Cresol** 98/100%. 10 cwt. lots d/d, per lb., 4s 9d.
o-**Cresol** 30/31°C. D/d, per lb., 1s.
p-**Cresol** 34/35°C. 10 cwt. lots d/d, per lb., 5s.
Dichloraniline. Per lb., 4s 6d.
Dinitrobenzene. 88/99°C., per lb., 2s 1d.
Dinitrotoluene. Drums extra. SP 15°C., per lb., 2s 1½d; SP 26°C., per lb., 1s 5d; SP 33°C., per lb., 1s 2½d; SP 66/68°C., per lb., 2s 1d.
p-**Nitraniline.** Per lb., 5s 1d.
Nitrobenzene. Spot, 90 gal. drums (drums extra), 1-ton lots d/d, per lb., 10d.
Nitronaphthalene. Per lb., 2s 5½d.
o-**Toluidine.** 8-10-cwt. drums (drums extra), per lb., 1s 11d.
p-**Toluidine.** In casks, per lb., 6s 1d.
Dimethylaniline. Drums extra, c.p., per lb., 3s 5d.

Chemical Stocks and Shares

HICKSON AND WELCH GROWTH PROSPECTS

STOCK markets over the last two weeks have continued to be uninspired and chemical shares were no exception. The Chancellor's statement last week that the Government's tough, drastic deflationary policies will not be relaxed, coupled with the persistent uncertainty about US business trends, have helped to hold markets at a low level. Borax 5s deferred, on the company's rather disappointing report and dividend, have reacted from 20s to 18s. Elsewhere little change has been marked.

1957/58 High	1957/58 Low	Security	21 Jan.	Change on last two weeks
23/7½	16/4½	Albright & W. 5/-	17/3	–4½d
11/6	10/6	Anchor 5/-	11/-	+3d
1/3	1/-	Ashe 1/-	1/1½	—
24/6	20/-	Bakelite 10/-	20/9	+1½d
7/10½	4/9	Berk F. W. 5/-	4/9	—
36/-	18/-	Borax Dfd. 5/-	18/-	–2/-
10/9	8/10½	Bt. Chrome 5/-	10/1½	+1½d
13/10½	10/3	Bt. Glues 4/-	12/-	–4½d
6/4½	4/9	B. I. Plastics 2/-	5/-	–3d
8/6	5/6	Bt. Tar 2/6	8/-	—
35/-	27/3	Bt. Xylonite	29/9	+3d
4/4½	3/6	Coalite 4/-	3/7½	—
60/3	45/9	Fisons	48/9	–9d
43/-	24/-	Glaxo 10/-	33/6	–1/6
9/6	7/9	Hardman & H. 5/-	7/9	+3d
34/6	24/11½	Hickson & W. 10/-	31/9	+3d
46/6	36/11½	ICI	38/6	–9d
4/9	2/6	Kleemann 1/-	3/3	+4½d
22/1½	14/6	Laporte 5/-	14/6	–1/6
22/-	13/9	Lawes 10/-	14/-	—
19/3	12/4½	Monsanto 5/-	13/3	–3d
15/6	11/-	Reichhold 5/-	11/-	–6d
11/9	9/-	Yorks. Dye 5/-	9/-	—

Hickson and Welch Holdings, made into a public company in November 1951 to acquire a group of companies which manufacture chemical products covering dyestuffs, intermediates, timber preservatives, etc., are the largest UK manufacturers of DDT. They have expanded their range of intermediates to cover those used in insecticides and pharmaceuticals. The most noteworthy develments have been in intermediates for the colour trade and the present considerable range is to be expanded in the future.

A further development in recent times has been the introduction of optical whitening agents and fast bases, used as additives, for the detergent, paper, and textile industry. For many years some of the dyestuff intermediates were also used in the pharmaceutical industry but intermediates specially required for synthetic drugs are now produced. Approximately two-thirds of the group's activities are engaged in chemical manufacture and one-third in timber preservatives.

Financially, trading profits over the last few years have advanced steadily, against a continued fall in overseas markets due to keener competition from continental chemical manufacturers, and costs have continued to rise at home. Despite these direct deductions the company has managed in most cases to meet foreign competition and by increased production has attained a record group turnover and profit last year.

Early last year proposals were approved authorising £150,000 of reserves to be capitalised and 300,000 ordinary 10s shares to be distributed to ordinary holding on the basis of three new shares for every 11 held. At today's price of around 31s 9d with a final dividend of 15 per cent on the increased capital forecast the shares offer a good growth stock for the small investor. The final dividend is expected to be announced within the next few days.

BoT Disposing of Stockpiled Cadmium

The Board of Trade are to dispose of 12½ tons of cadmium metal in rod form. This material, which represents the final balance of the Government's stockpile, is being offered immediately for sale by open tender for delivery before the end of March.

Forms of tender may be obtained from the Board of Trade, General Division, 7 Lacon House, Theobalds Road, London WC1.

Awards to Dunlop Employees

Dunlop have recently made examination awards of over £700 to 81 of their employees, including four awards worth £45 to students of chemistry. Almost two-thirds of the awards have gone to students taking science subjects.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London WC2, price 3s 3d including postage; annual subscription £8.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

ACCEPTANCES

Open to public inspection on 19 February

Preparation of alkyl aluminium dihalides. Esso Research & Engineering Co. **790 822**

Process for the conversion of organic halogen compounds into their homologous aldehydes. Badische Anilin- & Soda-Fabrik AG. **790 823**

Compound di-(2, 2, 2-tri-fluoroethyl) acetal of acetaldehyde, process for producing the compound, and process for producing 2, 2, 2-trifluoroethyl vinyl ether. Air Reduction Co. **790 824**

Haloaryl aziridinecarboxamides. Dow Chemical Co. **790 982**

Bonding natural or synthetic rubber. Phoenix Gummiwerke AG. [Divided out of 790 839.] **790 840**

Bituminous batch plants. Barber-Greene Co. **790 898**

Process for separating benzene hydrocarbons and naphthalene from gases containing same. Koppers Ges., H. [Addition to 765 469.] **790 987**

Manufacture of granulated ammonium phosphate fertilisers. Canadian Industries, Ltd. **790 988**

Recovering trimethylolethane. Celanese Corp. of America. [Divided out of 790 759.] **790 760**

Open to public inspection on 26 February

Process for the preparation of fluorocarbons. Fowler, R. W. **791 271**

Preparations for improving the soil. Busch, G. L. **791 333**

Alkaline storage batteries. Vogt, H. **791 075**

Desulphurisation of petroleum fractions. Socony Mobil Oil Co., Inc. **791 071**

Combined hydrocracking and hydroforming process. Socony Mobil Oil Co., Inc. **791 072**

Catalytic hydrocracking. Socony Mobil Oil Co., Inc. **791 073**

Viscose process and products. Rayonier, Inc. **791 321**

Heat resistant and oxidation proof materials. Aktiebolaget Kanthal. **791 323**

Treatment of carob beans. Industrias Agricolas Levantinas Soc. Anon. **791 077**

Process of, and apparatus for, the automatic counting of particles of any size and shape. Farbenfabriken Bayer AG. **791 079**

Water-repellents. Bradford Dyers' Association, Ltd. **791 117**

Preparation of sand for use in making foundry sand moulds and cores. Feslente, Ltd., and Leicester, Lovell & Co., Ltd. **791 381**

Chelates and compositions containing same. Du Pont De Nemours & Co., E. I. **791 325**

Organo-tin compounds. Pure Chemicals, Ltd. **791 119**

Disazo-dyestuffs and process for making same. Sciba Ltd. **791 164**

Preparation of oil solutions of oil soluble polyvalent metal petroleum sulphonates. Shell Research, Ltd. **791 212**

Interestification of fatty acid esters. Eastman Kodak Co. **791 165**

Production of niobium. UK Atomic Energy Authority. **791 121**

Fused salt bath for the electrodeposition of polyvalent metals titanium, niobium, tantalum and vanadium. Horizons Titanium Corp. **791 151**

Process and apparatus for transfer of fluidised solids. Gulf Research & Development Co. **791 154**

Process for the manufacture of dihydroxypropane compounds containing mercury. Ciba Ltd. [Addition to 776 776.] **791 125**

Process and apparatus for contacting reactants with fluidised solid particles and the transfer of such particles. Gulf Research & Development Co. **791 155**

Method for reducing the foaming tendency and for enhancing the wetting power of mercerising liquors. Ciba Ltd. **791 166**

Coating rubber surfaces. Imperial Chemical Industries, Ltd. **791 280**

Pharmaceutical products. Genatosan, Ltd. **791 281**

Deoxidation of steel. Westfalenhütte AG. **791 126**

Manufacture of highly polymeric polymethylene terephthalates. Imperial Chemical Industries, Ltd. **791 283**

Epoxidation of unsaturated fatty acid esters. Rohm & Haas Co. **791 285**

Process and plant for continuous steam distillation. Ballestra, M. **791 338**

Method of facilitating the dissolution of high molecular-weight cellulose derivatives. Mo Och Domsjo Aktiebolag. **791 315**

Safety devices for interval mixers and hydraulic presses. Hubron Rubber Chemicals, Ltd. **791 287**

Fuel and lubricating oil additive compounds obtained by reacting boron sulphides or boron thio-acids with terpenes or derivatives thereof. Esso Research & Engineering Co. [Addition to 782 989.] **791 083**

Agents for combating nematodes. Farbenfabriken Bayer AG. **791 291**

Alkaloid compounds and process of separating them. Penick & Co., S. B. **791 241**

Liquid-level indicators. Andrews, J. H. [Cognate application 17946.] **791 242**

Physicochemical analysis. Naamlooze Vennootschap Philips' Gloeilampenfabrieken. **791 088**

Printing and pad-dyeing of fabrics polyacrylonitrile. Sandoz, Ltd. [Addition to 767 053.] **791 294**

Method for removing water from liquid hydrocarbon compositions. Esso Research & Engineering Co. **791 089**

Cadmium sulphide yellow pigments. Farbenfabriken Bayer AG. **791 090**

4, 4-Disubstituted-5-oxohexanoic acids and derivatives thereof. Merck & Co., Inc. **791 350**

Transalkylation processes. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. **791 317**

Process for the production of peptides. Uclaf. **791 319**

Process for the manufacture of β-naphthoquinaldine. Imperial Chemical Industries, Ltd. **791 140**

Useful silane. Imperial Chemical Industries, Ltd. **791 169**

Devices for supplying pre-determined quantities of a liquid. Brauer, F. **791 170**

Process for preparing antibiotic substance from special bacterium in human blood plasma and earth. Ushiyama, A. **791 142**

Phenol-formaldehyde condensates. Imperial Chemical Industries, Ltd. **791 144**

Process for the manufacture of materials containing radioactive substances in ultra-fine dispersion. Möllen, H., and Hartmann, T. **791 252**

Application of perfluorochloroolefin polymer coating to base materials. Kellogg Co., M. W. **791 092**

Carburising liquids. Gilman & Son, Ltd., J. **791 298**

Production of lower halides of titanium, niobium, tantalum, vanadium, tungsten and molybdenum. Horizons Titanium Corp. **791 352**

Fatty acid residues. Esso Research & Engineering Co. **791 218**

Distilling plant for the preparation of alcohol. Bennett, Sons & Shears, Ltd., and Hutcheson, W. W. **791 299**

Fused salt bath for the electrodeposition of the polyvalent metals, titanium, niobium, tantalum and vanadium. Horizons Titanium Corp. **791 153**

Production of acrylic acid or derivatives thereof. Badische Anilin- & Soda-Fabrik AG. **791 300**

Bleaching wood pulps. Food Machinery & Chemical Corp. **791 352**

Purifying synthetic ethanol by distillation. National Petro-Chemicals Corp. **791 220**

Production of betaine hydrochloride. International Minerals & Chemical Corp. **791 146**

Hydroforming catalyst. Esso Research & Engineering Co. **791 147**

Stepwise process for the reduction of sulphur content in fluidised coke with steam and hydrogen. Esso Research & Engineering Co. **791 093**

Manufacture and use of supported molybdenum-containing catalysts. Universal Oil Products Co. **791 094**

Process for the production of dihydro compounds of amides of lysergic acid and isolysergic acid. Cilag, Ltd. **791 173**

Process for separating and recovering carbon dioxide from gaseous mixtures. Soc. Per Azioni Vetrocoke. **791 150**

Method of making dispersions of colour couplers for use in light-sensitive silver salt emulsions. Kodak, Ltd. **791 353**

Production of pigments of titanium dioxide. Soc. des Blancs de Zinc de la Mediterranee, E. Chaubary, P. Gindre & Cie. **791 302**

Process for preparing oxides of alkali metals and alkaline earth metals. Horizons, Inc. **791 385**

Hydantoin derivatives. Merck & Co., Inc. **791 327**

Preparing compositions containing glycidyl ethers. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. **791 303**

Transalkylation processes. Naamlooze Vennootschap de Bataafsche Petroleum Matschappij. [Addition to 791 317.] **791 318**

Vat dyestuffs of the anthraquinone series. Cassella Farbwerke Mainkur AG. **791 304**

Purification of secondary butyl alcohol by distillation. Esso Research & Engineering Co. **791 355**

TRADE NOTES

Chemical Company May Take Space in Hull

A large chemical concern is reported to be negotiating with the City of Hull, Yorks., on the possibility of taking factory space. It is understood that there would be employment for about 1,000 people.

Air Cleansing System

Weatherfoil Heating Systems have been given a contract by Monsanto Chemicals Ltd. for the design, supply and installation of pressurised ventilating systems, and fume and dust extraction equipment for the company's factory now being built at Fawley.

Belgian Office for Instrument Firm

Evershed and Vignoles Ltd. are to open a branch office in Belgium on 1 April. It will be under the management of Mr. C. Samyn who has handled the company's products in Belgium for some time.

Belgian Congo and Luxemburg will also be covered from this office which will be at Succursale, 142 Rue Gallait, Bruxelles.

Agency Agreement

Durham Raw Materials Ltd., 1/4 Great Tower Street, London EC3, and J. M. Huber Ltd., 6 Great Winchester Street, London EC2, announce that, as from 1 January Durham Raw Materials have been appointed distributors in the UK of materials manufactured by the J. M. Huber Corporation, 100 Park Avenue, New York 17. In addition to their well-known carbon blacks, these include Zeolex, an aluminium silicate reinforcing agent, Turgum S, Butac and Nutac, which are rubber rosins with specific uses, Actone, an activator/accelerator, and a range of hard clays of which there are no British equivalents. J. M. Huber will process all orders already received and contracted for, but Durham Raw Materials will deal with all those placed after 1 January.

New Telephone Numbers

From 20 January the telephone numbers for the three companies of the Distillers plastics group are: British Geon Ltd., Hyde Park 7321; British Resin Products Ltd. and Distrene Ltd., Hyde Park 0151. Formerly, all telephone calls for these companies passed through one central exchange serving the various Distillers industrial companies occupying Devonshire House, Piccadilly, London W1.

QVF to Sell Steel Vessels in UK

QVF Ltd. have assumed the selling agency throughout the UK for the glass-lined steel vessels produced by Muller and Co., Schwelmer Eisenwerk, Schwelm, Germany. The new agency will better enable QVF to offer a comprehensive service of design and erection of chemical plant in glass, both throughout Britain and abroad. It should also ensure the simultaneous delivery of the entire equipment for any installation.

Opening of New Science Block

THE rate of change, socially and culturally, in our lives during the past 50 years has in no way kept pace with the progress of science. Science has been allowed to go ahead and nothing has been done about it, said Sir Alexander Todd, Professor of Organic Chemistry at Cambridge University, addressing pupils at Strathallan School, near Perth, last week.

Sir Alexander, winner of the Nobel Prize for Chemistry last year, said that it would have to be put right pretty quickly. "Putting this right is the only way humanity, as a whole, can take advantage of the much fuller life offered by science," he added.

Sir Alexander was at the school to open a block of new laboratories built, with the aid of a grant from the Industrial Fund for the Advancement of Scientific Education in Schools.

New Fungicide for Apple Scab

Plant Protection Ltd., an Imperial Chemical Industries' subsidiary, have developed PP Liquid Mercury Plus, which, it is stated, can be used either as a routine protective spray or as a curative or eradicant spray following a period of scab infection.

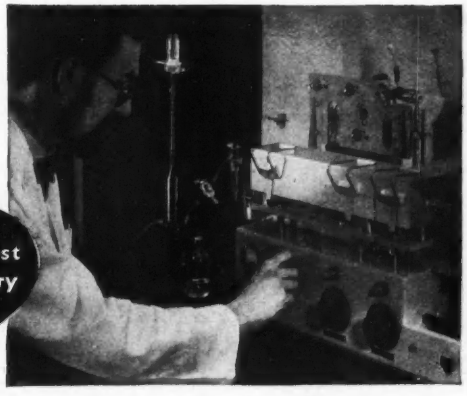
Better results in controlling apple scab are claimed for the compound which has been subjected to lengthy trials.

PP Liquid Mercury Plus is available in the form of a liquid, containing a mixture of organic mercury compounds combined with a special fungicidal compound.

Incidental information

No. II

items of interest from our laboratory notebooks



2-(2-Pyridyl)-imidazoline—is of interest to the theorist by reason of its structural relationship to 1:10—phenanthroline, and is of use to the practical analyst because of the selective reaction it affords for iron. (*see* **Anal. Chem.**, 1954, **26**, 217.) It has lately been added to the Hopkin & Williams range under Code 7275.8.

6-Aminothymol hydrochloride has been proposed quite recently (**Analyst**, 1957, **82**, 61) as a reagent for the colorimetric determination of thiamine in pharmaceutical and cereal products. The reagent is now available from Hopkin & Williams Limited (Hopkin & Williams Code 1395).

***tri*-Sodium pentacyano-ammine ferroate** provides a means of determining isoquinoline (*see* **Analyst**, 1956, **81**, 718) in the presence of quinoline and quinaldine. But the reagent must be of suitable quality for such an application. Hopkin & Williams Code 7972 has been specially prepared and tested for this purpose.

H&W

HOPKIN & WILLIAMS LTD.

Manufacturers of pure chemicals for Research and Analysis

CHADWELL HEATH · ESSEX · ENGLAND

Classified Advertisements

CLASSIFIED RATES: All sections 5d. per word. Minimum 8/-. Three or more insertions 4d. per word. Box Number 2/- extra. Up to 10 a.m. Tuesday for insertion same week.
SEMI-DISPLAY: 30/- per inch. Three or more insertions 25/- per inch.
SUBSCRIPTION: Annual Subscription of 52/6 brings 52 weekly copies of CHEMICAL AGE direct to your address from the printer (postage paid by the publishers), and a copy of CHEMICAL AGE YEAR BOOK.
COMPANY MEETINGS AND REPORTS: £12.12.0 per column. Three column measure (approximately 360 words).

EDUCATIONAL

A.M.I.CHEM.E.—More than one-third of the successful candidates since 1944 have been trained by T.I.G.B. All seeking quick promotion in the Chemical and Allied Industries should send for the T.I.G.B. Prospectus. 100 pages of expert advice, details of Guaranteed Home Study Courses for A.M.I.Chem.E., B.Sc.Eng., A.M.I.Mech.E., A.M.I.Prod.E., C. & G., etc., and a wide range of Diploma Courses in most branches of Engineering. Send for your copy today—**FREE.** T.I.G.B. (Dept. 84), 29 Wright's Lane, London, W.8.

UNIVERSITY COLLEGE OF NORTH STAFFORDSHIRE
U.S. Rubber Co. Post-Graduate Research Studentship
Applicants for this Studentship should have a good Honours Degree including Chemistry. The successful applicant will be expected to read for a higher degree, working on cationic polymerisation under the direction of Dr. P. H. Plesch. Stipend not less than £400 p.a. Applications, giving a brief curriculum vitae and names of two referees, should reach the Registrar, The College, Keele, Staffs, by 22nd February, 1958.

SITUATIONS VACANT

WORKS CHEMIST (QUALIFIED) required by old-established Chemical Manufacturers. Applicants should have had works experience and some experience in development of processes. Excellent prospects for suitable applicants. Non-contributory pension and bonus schemes in operation. Apply: Works Director, The Chemical Supply Co. Ltd., Abbey Road, Barking, Essex.

FOR SALE

MORTON, SON AND WARD LIMITED
offer
NEW UNITS in stainless or mild steel made to requirements:
CONDENSERS,
MIXING VESSELS,
JACKETED PANS with or without Mixing gear,
'MORWARD' 'U' shaped trough **MIXERS** with or without jackets,
TANKS: CYLINDERS: RECEIVERS: PRESSURE VESSELS and **AUTOCLAVES.**
NEW (ex stock):
JACKETED PANS:
100g, 150g and 200g in mild steel, suitable for 100 lb in jacket. With or without mixing gear.
TWO 600 gallon open top. **TWO** 400 gallon totally enclosed.
ONE 700 gallon **VERTICAL DIGESTER.**
Stirring gear can be fitted to any vessels.
New portable **STIRRING UNITS** with clamp-on attachment to requirements.
Enquiries invited:
MORTON, SON AND WARD LIMITED,
WALK MILL,
DOBCROSS, NEAR OLDHAM
Lancs.
'Phone Saddleworth 437

FOR SALE: continued

ONE EXCELLENT VERTICAL CAST IRON SEGMENTAL STORAGE TANK (new 1955) approx. 20ft. dia. by 9ft. deep. 1in. plate. Capacity 15,000 gallons.
TWO EXCELLENT VERTICAL CAST IRON SEGMENTAL STORAGE TANKS (1929) approx. 20ft. dia. by 9ft. deep. 1in. plate. Capacity 15,000 gallons.
ONE EXCELLENT VERTICAL CAST IRON SEGMENTAL STORAGE TANK (1929) approx. 20ft. dia. by 20ft. deep. 1in. plate. Capacity 20,000 gallons.
MADEN AND McKEE LTD.,
317 PRESCOT ROAD,
LIVERPOOL, 13

PHONE 98 STAINES
1,000 lbs. Dial Weighing Machine 3 ft. x 3 ft. platform.
42 in. Hydro Elec. Underdriven 400/3/50.
(3) 1,800 gall. Glass-lined Cyl. Enc. Tanks.
(30) 'Z' and Fin blade Mixers up to 36 in. x 36 in. x 30 in.
(6) 600 rigid rubber Enc. Tanks (Unused).
Stills, Pumps, Tanks, Condensers, Pans, S.S. Plant, etc.
Send for lists.
HARRY H. GARDAM & CO. LTD.
100 Church St., Staines.

MORTON, SON AND WARD LIMITED
offer
HYDRO EXTRACTORS
48 in. by **BROADBENT,** little used, complete with Igrani starter.
36 in. by **BROADBENT,** belt driven. Could be motorised
TWO 42 in. by **WATSON LAIDLAW,** under driven throug Vee ropes.
MIXERS
3 cwt. **TROUGH MIXERS** by **CHALMERS** and **GARDNER** s.s. lined troughs.
PUMPS
AQUATHERM centrifugal pumping set, 5 in. suction an delivery. 40,000 g.p.h. at 57 ft. hd.
New **MONO** Pumps and other second-hand pumps in stoc Enquiries invited:
MORTON, SON AND WARD LIMITED,
WALK MILL,
DOBCROSS, NEAR OLDHAM,
Lancs.
'Phone Saddleworth 437

Brand New **COCHRAN** Vertical and **ECONOMIC** Sel contained **STEAM BOILERS** in stock, also all sizes recond tioned and guaranteed. List on request.
STAINLESS STEEL TANKS, PANS, CONDENSERS PLATES, VALVES AND COCKS. Very wide selection.
400 gall. S.S. Autoclave, copper jacketed.
Ten new enamel-lined **ENCLOSED TANKS,** 150/1,000 gal
FRED WATKINS (BOILERS) LTD.,
COLEFORD, GLOS.
Phone: Coleford 2271/2

***BOX NUMBERS:** Reply c/o "Chemical Age" · Bouverie House · Fleet Street EC4.*